Access DB# 78665

SEARCH REQUEST FORM

Scientific and Technical Information Center

Requester's Full Name: JOHN MAPLES Examiner #: 62294 Date: 10/24/02
Art Unit: 1745 Phone Number 30 8-1795 Serial Number: 09/701,950
Mail Box and Bldg/Room Location: CPLR 3-8 E12 Results Format Preferred (circle): (PAPER) DISK E-MAIL

If more than one search is submitted, please prioritize searches in order of need.

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Please provide a detailed statement of the search topic, and describe as specifically as possible the subject matter to be searched. Include the elected species or structures, keywords, synonyms, acronyms, and registry numbers, and combine with the concept or utility of the invention. Define any terms that may have a special meaning. Give examples or relevant citations, authors, etc, if known. Please attach a copy of the cover sheet, pertinent claims, and abstract.

Title of Invention: METHOD FOR PRODUCING POSITIVE ELECTRODE ACTIVE MATERIAL FOR PRODUCING NON-AQUEOUS ELECTROLYTE SECONDARY BATTERY

Inventors (please provide full names): GUOHUA LI, ATSUO YAMADA, HIDETO AZUMA

Earliest Priority Filing Date: 4/6/1999

**For Sequence Searches Only* Please include all pertinent information (parent, child, divisional, or issued patent numbers) along with the appropriate serial number.*

A METHOD FOR PRODUCING A POSITIVE ACTIVE MATERIAL COMPRISING MIXING A PLURALITY OF SUBSTANCES TO GIVE A PRECURSOR, SINTERING THE PRECURSOR AND THUS FORMING $Li_x M_y PO_4$, WHERE $0 < x \leq 2$, $0.8 \leq y \leq 1.2$ AND M IS AT LEAST ONE 3d TRANSITION METAL.

SPECIFIC EXS. M = Fe
M = Fe, Mn

ALSO: IN MIXING STEP, A REDUCING AGENT CAN BE ADDED, AND/OR AND A DE-AERATING STEP CAN OCCUR, AND/OR A CONDUCTIVE AGENT CAN BE ADDED TO SAID PRECURSOR,

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STAFF USE ONLY	Type of Search	Vendors and cost where applicable
Searcher: EA	NA Sequence (#)	STN $138.43
Searcher Phone #:	AA Sequence (#)	Dialog
Searcher Location:	Structure (#) (4)	Questel/Orbit
Date Searcher Picked Up:	Bibliographic (and)	Dr.Link
Date Completed: 10-29-02	Litigation	Lexis/Nexis
Searcher Prep & Review Time: 5	Fulltext	Sequence Systems
~~Clerical Prep Time:~~	Patent Family	WWW/Internet
Online Time: 75	Other	Other (specify)

PTO-1590 (8-01)

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     FILE 'REGISTRY'
L1          7347 SEA (LI(L)P(L)O)/ELS
L2          2448 SEA L1 AND (T1 OR T2 OR T3)/PG
L3           991 SEA L2 AND O4P
L4           390 SEA L2 AND FE/ELS
L5            62 SEA L4 AND MN/ELS
L6           188 SEA L3 AND L4
L7            45 SEA L3 AND L5
L8             6 SEA L6 AND 4/ELC.SUB
L9            21 SEA L7 AND 5/ELC.SUB
L10           20 SEA L9 AND 4/NC
L11            5 SEA L8 AND 3/NC

     FILE 'HCA'
L12           64 SEA L10
L13           12 SEA L11
L14       208062 SEA (POS# OR POSITIV?)(2A)ELECTROD## OR CATHOD##
L15        42332 SEA NONAQ# OR NONAQUEOUS? OR NONH2O OR NONWATER? OR
                 NON(2A)(AQ# OR AQUEOUS? OR WATER? OR H2O)
L16       174136 SEA BATTERY OR BATTERIES OR (ELECTROCHEM? OR ELECTROLY?
                 OR GALVANI? OR WET OR DRY OR PRIMARY OR SECONDARY)(2A)(CE
                 LL OR CELLS) OR WETCELL? OR DRYCELL?
L17       389734 SEA ELECTROLY?
L18           19 SEA L12 AND (L14 OR L15 OR L16 OR L17 OR 52/SC,SX OR
                 72/SX,SC)
L19           12 SEA L13 AND (L14 OR L15 OR L16 OR L17 OR 52/SC,SX OR
                 72/SX,SC)
L20           18 SEA L12 AND (L15 OR L16 OR L17)
L21           17 SEA L12 AND L14
L22           17 SEA L20 AND L21
L23           12 SEA L13 AND (L15 OR L16 OR L17)
L24           12 SEA L13 AND L14
L25           12 SEA L23 AND L24

     FILE 'REGISTRY'
L26          114 SEA L3 AND 4/ELC.SUB
L27           43 SEA L26 AND 3/NC
L28           43 SEA L27 AND 0<LI<=2.0

     FILE 'HCA'
L29           44 SEA L28
L30           28 SEA L29 AND L14
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L31          27 SEA L29 AND (L15 OR L16 OR L17)
L32          27 SEA L30 AND L31
L33             QUE REDUC? OR REDN#
L34       16426 SEA DEAERAT? OR DEOXYGENAT? OR DE(A)(AERIF? OR AERAT? OR
                OXYGENAT?) OR DEAERIF?
L35             QUE COND# OR CONDUCT? OR SUPERCOND?
L36           5 SEA L32 AND L33
L37           0 SEA L32 AND L34
L38           5 SEA L32 AND L35
L39           1 SEA L36 AND L38
L40         440 SEA L3
L41         110 SEA L40 AND L14
L42          37 SEA L40 AND L15
L43         187 SEA L40 AND (L16 OR L17 OR 52/SC,SX OR 72/SC,SX)
L44          15 SEA (L41 OR L42 OR L43) AND L33
L45           0 SEA (L41 OR L42 OR L43) AND L34
L46          98 SEA (L41 OR L42 OR L43) AND L35
L47           7 SEA L44 AND L46
L48        1610 SEA L2
L49           1 SEA L48 AND L34
L50         137 SEA L48 AND L33
L51         359 SEA L48 AND L35
L52          22 SEA L50 AND L51
L53          13 SEA L52 AND (L14 OR L15 OR L16 OR L17 OR 52/SC,SX OR
                72/SC,SX)
L54          16 SEA L36 OR L38 OR L39 OR L47 OR L49
L55          19 SEA (L19 OR L25 OR L44 OR L53) NOT L54
L56          15 SEA (L18 OR L22) NOT (L54 OR L55)
L57           9 SEA L32 NOT (L54 OR L55 OR L56)


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L54  ANSWER 1 OF 16  HCA  COPYRIGHT 2002 ACS
137:127489  Electrochemical properties of lithium vanadium phosphate as a
     cathode material for lithium-ion batteries.
     Saidi, M. Y.; Barker, J.; Huang, H.; Swoyer, J. L.; Adamson, G.
     (Valence Technology, Incorporated, Henderson, NV, 89015, USA).
     Electrochemical and Solid-State Letters, 5(7), A149-A151 (English)
     2002.  CODEN: ESLEF6.  ISSN: 1099-0062.  Publisher: Electrochemical
     Society.
AB   The properties of the monoclinic lithium vanadium phosphate
     Li3V2(PO4)3 are investigated using x-ray diffraction and
     electrochem. methods.  Electrochem. measurements conducted
     in half-cells with Li3V2(PO4)3 as the cathode material and
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lithium metal as the anode have shown that this material exhibits an excellent reversibility when the charge extd. is confined to that equiv. to two lithiums per formula unit. The extn. of the last lithium is obsd. at a potential >4.6 V vs. Li/Li+ and involves a significant overvoltage. Upon discharge, however, x-ray diffraction has shown that the original structure is recovered.

IT **204653-30-5**, Lithium vanadium phosphate [Li3V2(PO4)3]
(electrochem. properties of lithium vanadium phosphate as **cathode** material for lithium-ion **batteries**)

RN 204653-30-5 HCA

CN Lithium vanadium phosphate (Li3V2(PO4)3) (9CI) (CA INDEX NAME)

Component	Ratio	Component Registry Number
O4P	3	14265-44-2
V	2	7440-62-2
Li	3	7439-93-2

CC 52-2 (Electrochemical, Radiational, and Thermal Energy Technology)

ST lithium vanadium phosphate **cathode battery**

IT **Battery cathodes**
(electrochem. properties of lithium vanadium phosphate as **cathode** material for lithium-ion **batteries**)

IT **204653-30-5**, Lithium vanadium phosphate [Li3V2(PO4)3]
(electrochem. properties of lithium vanadium phosphate as **cathode** material for lithium-ion **batteries**)

L54 ANSWER 2 OF 16 HCA COPYRIGHT 2002 ACS

137:8642 Methods of making lithium metal compounds useful as **cathode** active materials in **batteries**. Barker, Jeremy; Yazid, Saidi M.; Swoyer, Jeffrey L. (Valence Technology, Inc., USA). PCT Int. Appl. WO 2002044084 A2 20020606, 85 pp. DESIGNATED STATES: W: AE, AG, AL, AM, AT, AU, AZ, BA, BB, BG, BR, BY, BZ, CA, CH, CN, CO, CR, CU, CZ, DE, DK, DM, DZ, EC, EE, ES, FI, GB, GD, GE, GH, GM, HR, HU, ID, IL, IN, IS, JP, KE, KG, KP, KR, KZ, LC, LK, LR, LS, LT, LU, LV, MA, MD, MG, MK, MN, MW, MX, MZ, NO, NZ, OM, PH, PL, PT, RO, RU, SD, SE, SG, SI, SK, SL, TJ, TM, TR, TT, TZ, UA, UG, US, UZ, VN, YU, ZA, ZM, ZW, AM, AZ, BY, KG, KZ, MD, RU, TJ, TM; RW: AT, BE, BF, BJ, CF, CG, CH, CI, CM, CY, DE, DK, ES, FI, FR, GA, GB, GR, IE, IT, LU, MC, ML, MR, NE, NL, PT, SE, SN, TD, TG, TR. (English). CODEN: PIXXD2. APPLICATION: WO 2001-US43633 20011119. PRIORITY: US 2000-724085 20001128.

AB The invention provides a novel method for making lithium mixed metal materials for **battery cathodes**. The lithium mixed metal materials comprise lithium and at least one other metal besides lithium. The invention involves the reaction of a metal compd., a phosphate compd., with a **reducing** agent to **reduce** the metal and form a metal phosphate. The invention also includes methods of making lithium metal oxides involving reaction of a lithium compd. and a metal oxide with a **reducing** agent.

IT **204653-30-5P**, Lithium vanadium phosphate Li3V2(PO4)3
(methods of making lithium metal compds. useful as **cathode** active materials in **batteries**)
RN 204653-30-5 HCA
CN Lithium vanadium phosphate (Li3V2(PO4)3) (9CI) (CA INDEX NAME)

Component	Ratio	Component Registry Number
O4P	3	14265-44-2
V	2	7440-62-2
Li	3	7439-93-2

IC ICM C01B025-00
CC 52-2 (Electrochemical, Radiational, and Thermal Energy Technology)
Section cross-reference(s): 49
ST **battery cathode** lithium metal compd prepn
IT **Reduction**
(carbothermic; methods of making lithium metal compds. useful as **cathode** active materials in **batteries**)
IT Secondary **batteries**
(lithium; methods of making lithium metal compds. useful as **cathode** active materials in **batteries**)
IT **Battery cathodes**
Thermite process
(methods of making lithium metal compds. useful as **cathode** active materials in **batteries**)
IT 7664-38-2D, Phosphoric acid, transition metal compds. 7722-76-1, Ammonium dihydrogen phosphate 7757-87-1, Magnesium phosphate mg3(po4)2 7779-90-0, Zinc phosphate zn3(po4)2 7783-28-0, Diammonium hydrogen phosphate 7789-04-0, Chromium phosphate crpo4 7789-24-4, Lithium fluoride, processes 10045-86-0, Iron phosphate fepo4 13453-80-0, Lithium dihydrogen phosphate 14154-09-7, Manganese phosphate Mn3(PO4)2 14940-41-1, Iron phosphate fe3(po4)2 70172-55-3, Titanium phosphate tipo4
(methods of making lithium metal compds. useful as **cathode** active materials in **batteries**)
IT 7664-38-2DP, Phosphoric acid, lithiated transition metal compds. 12162-92-4P, Lithium vanadium oxide liv2o5 15365-14-7P, Iron lithium phosphate felipo4 **204653-30-5P**, Lithium vanadium phosphate Li3V2(PO4)3 349632-76-4P, Iron lithium magnesium phosphate (Fe0.9LiMg0.1(PO4)) 372075-82-6P, Lithium manganese fluoride phosphate LiMnFPO4 372075-83-7P, Lithium vanadium fluoride phosphate (LiVF(PO4)) 372075-84-8P, Chromium lithium fluoride phosphate CrLiFPO4 372075-85-9P, Lithium titanium fluoride phosphate LiTiFPO4 372075-86-0P 372075-87-1P, Iron lithium fluoride phosphate FeLiFPO4 433708-98-6P, Copper lithium fluoride phosphate (CuLiF(PO4)) 433708-99-7P, Cobalt lithium fluoride phosphate (CoLiF(PO4)) 433709-00-3P, Lithium nickel fluoride phosphate (LiNiF(PO4)) 433709-01-4P, Iron lithium magnesium phosphate (Fe0.67LiMg0.33(PO4))
(methods of making lithium metal compds. useful as

cathode active materials in **batteries**)

IT 1333-74-0, Hydrogen, reactions
(methods of making lithium metal compds. useful as **cathode** active materials in **batteries**)

IT 124-38-9, Carbon dioxide, uses 630-08-0, Carbon monoxide, uses 7440-37-1, Argon, uses 7727-37-9, Nitrogen, uses
(methods of making lithium metal compds. useful as **cathode** active materials in **batteries**)

IT 7440-44-0, Carbon, reactions
(**reducing** agent; methods of making lithium metal compds. useful as **cathode** active materials in **batteries**)

L54 ANSWER 3 OF 16 HCA COPYRIGHT 2002 ACS

136:297382 Carbon-coated or carbon-crosslinked redox materials with transition metal-lithium oxide core for use as **battery** electrodes. Armand, Michel; Gauthier, Michel; Magnan, Jean-Francois; Ravet, Nathalie (Hydro-Quebec, Can.). PCT Int. Appl. WO 2002027824 A1 20020404, 78 pp. DESIGNATED STATES: W: AE, AG, AL, AM, AT, AU, AZ, BA, BB, BG, BR, BY, BZ, CA, CH, CN, CO, CR, CU, CZ, DE, DK, DM, DZ, EC, EE, ES, FI, GB, GD, GE, GH, GM, HR, HU, ID, IL, IN, IS, JP, KE, KG, KP, KR, KZ, LC, LK, LR, LS, LT, LU, LV, MA, MD, MG, MK, MN, MW, MX, MZ, NO, NZ, PH, PL, PT, RO, RU, SD, SE, SG, SI, SK, SL, TJ, TM, TR, TT, TZ, UA, UG, US, UZ, VN, YU, ZA, ZW, AM, AZ, BY, KG, KZ, MD, RU, TJ, TM; RW: AT, BE, BF, BJ, CF, CG, CH, CI, CM, CY, DE, DK, ES, FI, FR, GA, GB, GR, IE, IT, LU, MC, ML, MR, NE, NL, PT, SE, SN, TD, TG, TR. (French). CODEN: PIXXD2. APPLICATION: WO 2001-CA1350 20010921. PRIORITY: CA 2000-2320661 20000926.

AB Carbon-coated redox materials suitable for use in **battery** electrodes consist of a core surrounded by a coating, or interconnected by carbon crosslinks, in which the core includes a compn. of formula LixM1-yM'y(XO4)n, in which y = 0-0.6, x = 0-2, n = 0-1.5; M is a transition metal; and M' is a element of fixed valence selected from Mg2+, Ca2+, Al3+, and Zn2+, and X is S, P, and Si. Synthesis of the materials is carried out by reacting a balanced mixt. of appropriate precursors in a **reducing** atm., to adjust the valence of the transition metals, in the presence of a carbon source, which is then pyrolyzed. The resulting products exhibit an excellent elec. **cond**. and a highly enhanced chem. activity.

IT **407640-63-5**, Iron lithium titanium phosphate sulfate (Fe0.85Li1.35Ti0.15(PO4)0.5(SO4))
(electrodes contg.; carbon-coated or carbon-crosslinked redox materials with transition metal-lithium oxide core for use as **battery** electrodes)

RN 407640-63-5 HCA

CN Iron lithium titanium phosphate sulfate (Fe0.85Li1.35Ti0.15(PO4)0.5(SO4)) (9CI) (CA INDEX NAME)

Component	Ratio	Component Registry Number

O4S	1	14808-79-8
O4P	0.5	14265-44-2
Ti	0.15	7440-32-6
Li	1.35	7439-93-2
Fe	0.85	7439-89-6

IT **213467-46-0**, Iron lithium manganese phosphate (FeLi2Mn(PO4)2)
(electrodes contg.; carbon-coated or carbon-crosslinked redox materials with transition metal-lithium oxide core for use as **battery** electrodes)
RN 213467-46-0 HCA
CN Iron lithium manganese phosphate (FeLi2Mn(PO4)2) (9CI) (CA INDEX NAME)

Component	Ratio	Component Registry Number
O4P	2	14265-44-2
Mn	1	7439-96-5
Li	2	7439-93-2
Fe	1	7439-89-6

IT **407640-52-2**, Iron lithium manganese phosphate (Fe0.1-1LiMn0-0.9(PO4)) **407640-53-3**, Iron lithium magnesium phosphate (Fe0.7-1LiMg0-0.3(PO4)) **407640-54-4**, Calcium iron lithium phosphate (Ca0-0.3Fe0.7-1Li(PO4)) **407640-55-5** **407640-56-6**, Iron lithium phosphate silicate (FeLi1-1.9(PO4)0.1-1(SiO4)0-0.9) **407640-58-8**, Iron lithium manganese phosphate sulfate (Fe0-1Li1-1.2Mn0-0.2[(PO4),(SO4)]) **407640-59-9**, Iron lithium manganese phosphate ((Fe,Mn)Li1-1.6(PO4)) **407640-60-2**, Iron lithium manganese phosphate sulfate (Fe1-2Li1-2Mn0-1[(PO4),(SO4)]) **407640-61-3**, Iron lithium titanium phosphate ((Fe,Ti)Li0.5-2(PO4)1.5)
(metal source; carbon-coated or carbon-crosslinked redox materials with transition metal-lithium oxide core for use as **battery** electrodes)
RN 407640-52-2 HCA
CN Iron lithium manganese phosphate (Fe0.1-1LiMn0-0.9(PO4)) (9CI) (CA INDEX NAME)

Component	Ratio	Component Registry Number
O4P	1	14265-44-2
Mn	0 - 0.9	7439-96-5
Li	1	7439-93-2
Fe	0.1 - 1	7439-89-6

RN 407640-53-3 HCA
CN Iron lithium magnesium phosphate (Fe0.7-1LiMg0-0.3(PO4)) (9CI) (CA

INDEX NAME)

Component	Ratio	Component Registry Number
O4P	1	14265-44-2
Mg	0 - 0.3	7439-95-4
Li	1	7439-93-2
Fe	0.7 - 1	7439-89-6

RN 407640-54-4 HCA
CN Calcium iron lithium phosphate (Ca0-0.3Fe0.7-1Li(PO4)) (9CI) (CA INDEX NAME)

Component	Ratio	Component Registry Number
O4P	1	14265-44-2
Ca	0 - 0.3	7440-70-2
Li	1	7439-93-2
Fe	0.7 - 1	7439-89-6

RN 407640-55-5 HCA
CN Iron lithium magnesium manganese phosphate (Fe0-1LiMg0-0.2Mn0-1(PO4)) (9CI) (CA INDEX NAME)

Component	Ratio	Component Registry Number
O4P	1	14265-44-2
Mn	0 - 1	7439-96-5
Mg	0 - 0.2	7439-95-4
Li	1	7439-93-2
Fe	0 - 1	7439-89-6

RN 407640-56-6 HCA
CN Iron lithium phosphate silicate (FeLi1-1.9(PO4)0.1-1(SiO4)0-0.9) (9CI) (CA INDEX NAME)

Component	Ratio	Component Registry Number
O4Si	0 - 0.9	17181-37-2
O4P	0.1 - 1	14265-44-2
Li	1 - 1.9	7439-93-2
Fe	1	7439-89-6

RN 407640-58-8 HCA
CN Iron lithium manganese phosphate sulfate (Fe0-1Li1-1.2Mn0-0.2[(PO4),(SO4)]) (9CI) (CA INDEX NAME)

Component	Ratio	Component

		Registry Number
O4S	0 - 1	14808-79-8
O4P	0 - 1	14265-44-2
Mn	0 - 0.2	7439-96-5
Li	1 - 1.2	7439-93-2
Fe	0 - 1	7439-89-6

RN 407640-59-9 HCA
CN Iron lithium manganese phosphate ((Fe,Mn)Li1-1.6(PO4)) (9CI) (CA INDEX NAME)

Component	Ratio	Component Registry Number
O4P	1	14265-44-2
Mn	0 - 1	7439-96-5
Li	1 - 1.6	7439-93-2
Fe	0 - 1	7439-89-6

RN 407640-60-2 HCA
CN Iron lithium manganese phosphate sulfate (Fe1-2Li1-2Mn0-1[(PO4),(SO4)]) (9CI) (CA INDEX NAME)

Component	Ratio	Component Registry Number
O4S	0 - 1	14808-79-8
O4P	0 - 1	14265-44-2
Mn	0 - 1	7439-96-5
Li	1 - 2	7439-93-2
Fe	1 - 2	7439-89-6

RN 407640-61-3 HCA
CN Iron lithium titanium phosphate ((Fe,Ti)Li0.5-2(PO4)1.5) (9CI) (CA INDEX NAME)

Component	Ratio	Component Registry Number
O4P	1.5	14265-44-2
Ti	0 - 1	7440-32-6
Li	0.5 - 2	7439-93-2
Fe	0 - 1	7439-89-6

IC ICM H01M004-48
ICS C01B025-37; C01B033-20; H01M004-58; H01M004-62; C01B017-96
CC **52-2** (Electrochemical, Radiational, and Thermal Energy Technology)
ST carbon encapsulated redox material **battery** electrode; **cathode battery** carbon coated redox material
IT Silanes

(alkoxy, silicon source; carbon-coated or carbon-crosslinked redox materials with transition metal-lithium oxide core for use as **battery** electrodes)

IT Polyoxyalkylenes, uses
(alkyl ethers, oligomeric, aprotic solvent; carbon-coated or carbon-crosslinked redox materials with transition metal-lithium oxide core for use as **battery** electrodes)

IT Fluoropolymers, uses
Polyesters, uses
Polyethers, uses
(binders; carbon-coated or carbon-crosslinked redox materials with transition metal-lithium oxide core for use as **battery** electrodes)

IT **Battery cathodes**
Battery electrodes
Redox agents
(carbon-coated or carbon-crosslinked redox materials with transition metal-lithium oxide core for use as **battery** electrodes)

IT Transition metals, uses
(electrodes contg.; carbon-coated or carbon-crosslinked redox materials with transition metal-lithium oxide core for use as **battery** electrodes)

IT 78-93-3, Methyl ethyl ketone, uses 96-48-0, Butyrolactone 96-49-1, Ethylene carbonate 107-21-1D, Ethylene glycol, alkyl ethers 108-32-7, Propylene carbonate 111-46-6D, Diethylene glycol, alkyl ethers 112-27-6D, Triethylene glycol, alkyl ethers 112-60-7D, Tetraethylene glycol, alkyl ethers 463-79-6D, Carbonic acid, C1-4-alkyl esters
(aprotic solvent; carbon-coated or carbon-crosslinked redox materials with transition metal-lithium oxide core for use as **battery** electrodes)

IT 9011-14-7, Poly(methyl methacrylate) 24937-79-9, Poly(vinylidene difluoride) 25014-41-9, Polyacrylonitrile
(binders; carbon-coated or carbon-crosslinked redox materials with transition metal-lithium oxide core for use as **battery** electrodes)

IT 50-99-7, Glucose, reactions 57-48-7, Fructose, reactions 57-50-1, Sucrose, reactions 58-86-6, Xylose, reactions 87-79-6, Sorbose 9002-88-4, Polyethylene 9003-07-0, Polypropylene 9004-34-6, Cellulose, reactions 9004-34-6D, Cellulose, esters 9004-35-7, Cellulose acetate 9005-25-8, Starch, reactions 25212-86-6, Poly(furfuryl alcohol) 43094-71-9, Ethylene-ethylene oxide copolymer
(carbon source; carbon-coated or carbon-crosslinked redox materials with transition metal-lithium oxide core for use as **battery** electrodes)

IT **407640-63-5**, Iron lithium titanium phosphate sulfate (Fe0.85Li1.35Ti0.15(PO4)0.5(SO4))
(electrodes contg.; carbon-coated or carbon-crosslinked redox materials with transition metal-lithium oxide core for use as **battery** electrodes)

IT 7439-89-6D, Iron, mixed oxides 7439-96-5D, Manganese, mixed oxides 7440-02-0D, Nickel, mixed oxides 7440-32-6D, Titanium, mixed oxides 7440-47-3D, Chromium, mixed oxides 7440-48-4D, Cobalt, mixed oxides 7440-50-8D, Copper, mixed oxides 7440-62-2D, Vanadium, mixed oxides 13816-45-0, Triphylite 15365-14-7, Iron lithium phosphate (FeLiPO4) **213467-46-0**, Iron lithium manganese phosphate (FeLi2Mn(PO4)2)
(electrodes contg.; carbon-coated or carbon-crosslinked redox materials with transition metal-lithium oxide core for use as **battery** electrodes)

IT 90076-65-6
(**electrolyte** contg.; carbon-coated or carbon-crosslinked redox materials with transition metal-lithium oxide core for use as **battery** electrodes)

IT 516-03-0, Ferrous oxalate
(iron source; carbon-coated or carbon-crosslinked redox materials with transition metal-lithium oxide core for use as **battery** electrodes)

IT 7429-90-5, Aluminum, uses 7440-31-5, Tin, uses 7440-36-0, Antimony, uses 7440-66-6, Zinc, uses 7782-42-5, Graphite, uses 39302-37-9, Lithium titanate 207803-50-7, Aluminum cobalt lithium magnesium nickel oxide 258511-24-9, Iron lithium nitride 263898-18-6, Cobalt manganese nitride 407640-62-4
(lithium-based **cathodes** contg.; carbon-coated or carbon-crosslinked redox materials with transition metal-lithium oxide core for use as **battery** electrodes)

IT 638-38-0, Manganese(II) acetate
(manganese source; carbon-coated or carbon-crosslinked redox materials with transition metal-lithium oxide core for use as **battery** electrodes)

IT 546-89-4, Lithium acetate 553-91-3, Lithium oxalate 554-13-2, Lithium carbonate 1309-37-1, Ferric oxide, reactions 1310-65-2, Lithium hydroxide 1313-13-9, Manganese dioxide, reactions 1314-62-1, Vanadium pentoxide, reactions 1317-61-9, Magnetite, reactions 10045-86-0, Ferric phosphate 10102-24-6, Lithium silicate (Li2SiO3) 10377-48-7, Lithium sulfate 10377-52-3, Lithium phosphate (Li3PO4) 10421-48-4, Ferric nitrate 12057-24-8, Lithium oxide, reactions 12627-14-4 13453-80-0, Lithium dihydrogen phosphate 63985-45-5, Lithium orthosilicate **407640-52-2**, Iron lithium manganese phosphate (Fe0.1-1LiMn0-0.9(PO4)) **407640-53-3**, Iron lithium magnesium phosphate (Fe0.7-1LiMg0-0.3(PO4)) **407640-54-4**, Calcium iron lithium phosphate (Ca0-0.3Fe0.7-1Li(PO4)) **407640-55-5 407640-56-6**, Iron lithium phosphate silicate (FeLi1-1.9(PO4)0.1-1(SiO4)0-0.9) 407640-57-7 **407640-58-8**, Iron lithium manganese phosphate sulfate (Fe0-1Li1-1.2Mn0-0.2[(PO4),(SO4)]) **407640-59-9**, Iron lithium manganese phosphate ((Fe,Mn)Li1-1.6(PO4)) **407640-60-2**, Iron lithium manganese phosphate sulfate (Fe1-2Li1-2Mn0-1[(PO4),(SO4)]) **407640-61-3**, Iron lithium titanium phosphate ((Fe,Ti)Li0.5-2(PO4)1.5)
(metal source; carbon-coated or carbon-crosslinked redox

materials with transition metal-lithium oxide core for use as **battery** electrodes)

IT 25322-68-3D, Polyethylene glycol, alkyl ethers
(oligomeric, aprotic solvent; carbon-coated or carbon-crosslinked redox materials with transition metal-lithium oxide core for use as **battery** electrodes)

IT 7664-38-2, Phosphoric acid, reactions 7664-38-2D, Phosphoric acid, esters 7783-28-0, Ammonium hydrogen phosphate 10124-54-6, Manganese phosphate
(phosphorus source; carbon-coated or carbon-crosslinked redox materials with transition metal-lithium oxide core for use as **battery** electrodes)

IT 7631-86-9, Silica, reactions
(silicon source; carbon-coated or carbon-crosslinked redox materials with transition metal-lithium oxide core for use as **battery** electrodes)

IT 7664-93-9, Sulfuric acid, reactions 7783-20-2, Ammonium sulfate, reactions
(sulfur source; carbon-coated or carbon-crosslinked redox materials with transition metal-lithium oxide core for use as **battery** electrodes)

L54 ANSWER 4 OF 16 HCA COPYRIGHT 2002 ACS

136:297381 Method for synthesis of carbon-coated redox materials with controlled size. Armand, Michel; Gauhtier, Michel; Magnan, Jean-Francois; Ravet, Nathalie (Hydro-Quebec, Can.). PCT Int. Appl. WO 2002027823 A1 20020404, 83 pp. DESIGNATED STATES: W: AE, AG, AL, AM, AT, AU, AZ, BA, BB, BG, BR, BY, BZ, CA, CH, CN, CO, CR, CU, CZ, DE, DK, DM, DZ, EC, EE, ES, FI, GB, GD, GE, GH, GM, HR, HU, ID, IL, IN, IS, JP, KE, KG, KP, KR, KZ, LC, LK, LR, LS, LT, LU, LV, MA, MD, MG, MK, MN, MW, MX, MZ, NO, NZ, PH, PL, PT, RO, RU, SD, SE, SG, SI, SK, SL, TJ, TM, TR, TT, TZ, UA, UG, US, UZ, VN, YU, ZA, ZW, AM, AZ, BY, KG, KZ, MD, RU, TJ, TM; RW: AT, BE, BF, BJ, CF, CG, CH, CI, CM, CY, DE, DK, ES, FI, FR, GA, GB, GR, IE, IT, LU, MC, ML, MR, NE, NL, PT, SE, SN, TD, TG, TR. (French). CODEN: PIXXD2. APPLICATION: WO 2001-CA1349 20010921. PRIORITY: CA 2000-2320661 20000926.

AB Carbon-coated redox materials suitable for use as **battery** electrodes and for fabrication of electrochromic materials, consist of compns. of formulas C-LixM1-y (XO4)n or LixM1-yM'y (XO4)n, in which: y = 0-0.6; x = 0-2; n = 1-1.5; M is a transition metal or a mixt. of first-row transition metals; M' is a fixed-valent metal ion selected from Mg2+, Ca2+, Al3+, or Zn2+; and X is S, P, and Si. The resulting materials consist of particles coated with a **conductive** carbon layer. The compns. are prepd. by reacting a balanced mixt. of precursors in the appropriate proportions, including a pyrolysis step for the carbon-producing compd.(s), such that the materials form a powd. compn. with the desired formula, that has an elec. **cond**. of >10-8 S/cm when compacted at 3750 kg/cm2.

IT **213467-46-0P**, Iron lithium manganese phosphate (FeLi2Mn(PO4)2)
(redox **cathode** contg.; synthesis of carbon-coated redox

materials for use as **battery cathodes** and in electrochromic devices)

RN 213467-46-0 HCA

CN Iron lithium manganese phosphate (FeLi2Mn(PO4)2) (9CI) (CA INDEX NAME)

Component	Ratio	Component Registry Number
O4P	2	14265-44-2
Mn	1	7439-96-5
Li	2	7439-93-2
Fe	1	7439-89-6

IC ICM H01M004-48
ICS H01M004-58; H01M004-62; C01B025-37; C01B033-20

CC **52-2** (Electrochemical, Radiational, and Thermal Energy Technology)
Section cross-reference(s): **72**

ST carbon encapsulated redox material **battery** electrode; electrochromic material carbon coated redox particle size; **cathode battery** carbon coated redox material

IT Fluoropolymers, uses
(binder; synthesis of carbon-coated redox materials for use as **battery cathodes** and in electrochromic devices)

IT **Battery cathodes**
Battery electrodes
Electrochromic materials
Redox agents
(synthesis of carbon-coated redox materials for use as **battery cathodes** and in electrochromic devices)

IT 24937-79-9, Poly(vinylidene difluoride)
(binder; synthesis of carbon-coated redox materials for use as **battery cathodes** and in electrochromic devices)

IT 9004-35-7, Cellulose acetate 43094-71-9, Ethylene-ethylene oxide copolymer
(carbon source; synthesis of carbon-coated redox materials for use as **battery cathodes** and in electrochromic devices)

IT 7440-44-0, Carbon, uses
(coating, **cathodes** contg.; synthesis of carbon-coated redox materials for use as **battery cathodes** and in electrochromic devices)

IT 96-49-1, Ethylene carbonate 616-38-6, Dimethylcarbonate 7791-03-9, Lithium perchlorate 90076-65-6, Methanesulfonamide, 1,1,1-trifluoro-N-[(trifluoromethyl)sulfonyl]-, lithium salt
(**electrolyte** contg.; synthesis of carbon-coated redox materials for use as **battery cathodes** and in electrochromic devices)

IT 554-13-2, Lithium carbonate
(reaction of; synthesis of carbon-coated redox materials for use as **battery cathodes** and in electrochromic

devices)
IT 13463-10-0, Ferric phosphate dihydrate
(**redn**. of; synthesis of carbon-coated redox materials for use as **battery cathodes** and in electrochromic devices)
IT 7429-90-5P, Aluminum, uses 7439-95-4P, Magnesium, uses 7440-66-6P, Zinc, uses 7440-70-2P, Calcium, uses 13816-45-0P, Triphylite 15365-14-7P, Iron lithium phosphate (FeLiPO4) **213467-46-0P**, Iron lithium manganese phosphate (FeLi2Mn(PO4)2)
(redox **cathode** contg.; synthesis of carbon-coated redox materials for use as **battery cathodes** and in electrochromic devices)

L54 ANSWER 5 OF 16 HCA COPYRIGHT 2002 ACS
136:265825 Method for the preparation of **cathode** active material for a **nonaqueous electrolyte battery**. Hosoya, Mamoru; Takahashi, Kimio; Fukushima, Yuzuru (Sony Corporation, Japan). Eur. Pat. Appl. EP 1193783 A2 20020403, 20 pp. DESIGNATED STATES: R: AT, BE, CH, DE, DK, ES, FR, GB, GR, IT, LI, LU, NL, SE, MC, PT, IE, SI, LT, LV, FI, RO. (English). CODEN: EPXXDW. APPLICATION: EP 2001-122751 20010921. PRIORITY: JP 2000-301400 20000929.
AB A **nonaq. electrolyte cell** is disclosed having superior electronic **cond**. and superior cell characteristics. A **cathode** active material used for the cell is a composite material of a compd. having the formula LixFePO4, where 0<x.ltoreq.1.0, and a carbon material, wherein the sp. surface area as found by the Brunauer Emmet Teller formula is not less than 10.3 m2/g.
IT **198782-39-7P**, Iron lithium phosphate (FeLi0-1(PO4))
(method for prepn. of **cathode** active material for **nonaq. electrolyte battery**)
RN 198782-39-7 HCA
CN Iron lithium phosphate (FeLi0-1(PO4)) (9CI) (CA INDEX NAME)

Component	Ratio	Component Registry Number
O4P	1	14265-44-2
Li	0 - 1	7439-93-2
Fe	1	7439-89-6

IC ICM H01M004-58
ICS H01M010-40
CC 52-2 (Electrochemical, Radiational, and Thermal Energy Technology)
ST **battery nonaq electrolyte cathode** lithium iron phosphate
IT Secondary **batteries**
(lithium; method for prepn. of **cathode** active material for **nonaq. electrolyte battery**)
IT **Battery cathodes**

Surface area
(method for prepn. of **cathode** active material for **nonaq. electrolyte battery**)

IT Carbon black, uses
Carbonaceous materials (technological products)
(method for prepn. of **cathode** active material for **nonaq. electrolyte battery**)

IT Fluoropolymers, uses
(method for prepn. of **cathode** active material for **nonaq. electrolyte battery**)

IT 108-32-7, Propylene carbonate 616-38-6, Dimethyl carbonate 7439-93-2, Lithium, uses 7440-44-0, Carbon, uses 21324-40-3, Lithium hexafluorophosphate
(method for prepn. of **cathode** active material for **nonaq. electrolyte battery**)

IT 24937-79-9, Pvdf
(method for prepn. of **cathode** active material for **nonaq. electrolyte battery**)

IT 15365-14-7P, Iron lithium phosphate FeLiPO4 **198782-39-7P**, Iron lithium phosphate (FeLi0-1(PO4))
(method for prepn. of **cathode** active material for **nonaq. electrolyte battery**)

L54 ANSWER 6 OF 16 HCA COPYRIGHT 2002 ACS

136:203096 Method for preparation of **cathode** active material for **nonaqueous electrolyte battery**.
Hosoya, Mamoru; Takahashi, Kimio; Fukushima, Yuzuru (Sony Corporation, Japan). Eur. Pat. Appl. EP 1184920 A2 20020306, 21 pp. DESIGNATED STATES: R: AT, BE, CH, DE, DK, ES, FR, GB, GR, IT, LI, LU, NL, SE, MC, PT, IE, SI, LT, LV, FI, RO. (English). CODEN: EPXXDW. APPLICATION: EP 2001-120637 20010830. PRIORITY: JP 2000-261277 20000830.

AB A **cathode** active material improved in electron **cond.** and a **non-aq. electrolyte cell** employing this **cathode** active material and which is improved in cell capacity and cyclic characteristics are disclosed. The **cathode** active material is composed of a compd. having the general formula LixFePO4 where 0 < x .ltoreq. 1.0, and a carbon material, with the carbon content per unit wt. being not less than 3 wt% and with the powder d. being not lower than 2.2 g/cm3.

IT **198782-39-7P**, Iron lithium phosphate (FeLi0-1(PO4))
(method for prepn. of **cathode** active material for **nonaq. electrolyte battery**)

RN 198782-39-7 HCA

CN Iron lithium phosphate (FeLi0-1(PO4)) (9CI) (CA INDEX NAME)

Component	Ratio	Component Registry Number
O4P	1	14265-44-2
Li	0 - 1	7439-93-2

Fe | 1 | 7439-89-6

IC ICM H01M004-58
ICS H01M004-62; H01M004-04
CC 52-2 (Electrochemical, Radiational, and Thermal Energy Technology)
ST **cathode** active material prepn **nonaq** **electrolyte battery**
IT Secondary **batteries**
(lithium; method for prepn. of **cathode** active material for **nonaq. electrolyte battery**)
IT **Battery cathodes**
Sintering
(method for prepn. of **cathode** active material for **nonaq. electrolyte battery**)
IT Carbonaceous materials (technological products)
Fluoropolymers, uses
(method for prepn. of **cathode** active material for **nonaq. electrolyte battery**)
IT Carbon black, uses
(method for prepn. of **cathode** active material for **nonaq. electrolyte battery**)
IT 10045-86-0, Phosphoric acid, iron(3+) salt (1:1) 10377-52-3, Lithium phosphate
(method for prepn. of **cathode** active material for **nonaq. electrolyte battery**)
IT 96-49-1, Ethylene carbonate 108-32-7, Propylene carbonate 616-38-6, Dimethyl carbonate 7439-93-2, Lithium, uses 21324-40-3, Lithium hexafluorophosphate
(method for prepn. of **cathode** active material for **nonaq. electrolyte battery**)
IT 24937-79-9, Pvdf
(method for prepn. of **cathode** active material for **nonaq. electrolyte battery**)
IT 15365-14-7P, Iron lithium phosphate FeLiPO4 **198782-39-7P**, Iron lithium phosphate (FeLi0-1(PO4))
(method for prepn. of **cathode** active material for **nonaq. electrolyte battery**)
IT 7440-44-0, Carbon, uses
(method for prepn. of **cathode** active material for **nonaq. electrolyte battery**)

L54 ANSWER 7 OF 16 HCA COPYRIGHT 2002 ACS
135:109740 Preparation of lithium-containing materials for **battery cathodes**. Barker, Jeremy; Saidi, M. Yazid; Swoyer, Jeffrey L. (Valence Technology, Inc., USA). PCT Int. Appl. WO 2001053198 A1 20010726, 94 pp. DESIGNATED STATES: W: AE, AG, AL, AM, AT, AU, AZ, BA, BB, BG, BR, BY, BZ, CA, CH, CN, CR, CU, CZ, DE, DK, DM, DZ, EE, ES, FI, GB, GD, GE, GH, GM, HR, HU, ID, IL, IN, IS, JP, KE, KG, KP, KR, KZ, LC, LK, LR, LS, LT, LU, LV, MA, MD, MG, MK, MN, MW, MX, MZ, NO, NZ, PL, PT, RO, RU, SD, SE, SG, SI, SK, SL, TJ, TM, TR, TT, TZ, UA, UG, US, UZ, VN, YU, ZA, ZW, AM, AZ, BY, KG, KZ, MD, RU, TJ, TM; RW: AT, BE, BF, BJ, CF, CG, CH, CI, CM, CY,

DE, DK, ES, FI, FR, GA, GB, GR, IE, IT, LU, MC, ML, MR, NE, NL, PT, SE, SN, TD, TG, TR. (English). CODEN: PIXXD2. APPLICATION: WO 2000-US35438 20001222. PRIORITY: US 2000-484919 20000118.

AB The invention provides novel lithium-mixed metal materials which, upon electrochem. interaction, release lithium ions, and are capable of reversibly cycling lithium ions. The invention provides a rechargeable lithium **battery** which comprises an electrode formed from the novel lithium-mixed metal materials. Methods for making the novel lithium-mixed metal materials and methods for using such lithium-mixed metal materials in **electrochem. cells** are also provided. The lithium-mixed metal materials comprise lithium and at least one other metal besides lithium. Preferred materials are lithium-mixed metal phosphates which contain lithium and two other metals besides lithium.

IT **204653-30-5P**, Lithium vanadium phosphate Li3V2(PO4)3
(prepn. of lithium-contg. materials for **battery cathodes**)

RN 204653-30-5 HCA

CN Lithium vanadium phosphate (Li3V2(PO4)3) (9CI) (CA INDEX NAME)

Component	Ratio	Component Registry Number
O4P	3	14265-44-2
V	2	7440-62-2
Li	3	7439-93-2

IC ICM C01B025-37
ICS C01B025-45; H01M004-58

CC 52-2 (Electrochemical, Radiational, and Thermal Energy Technology)
Section cross-reference(s): 49

ST lithium mixed metal phosphate **battery cathode**

IT **Reduction**
(carbothermic; prepn. of lithium-contg. materials for **battery cathodes**)

IT Secondary **batteries**
(lithium; prepn. of lithium-contg. materials for **battery cathodes**)

IT **Battery cathodes**
(prepn. of lithium-contg. materials for **battery cathodes**)

IT 12162-92-4P, lithium vanadium oxide liv2o5 **204653-30-5P**, Lithium vanadium phosphate Li3V2(PO4)3 349632-76-4P, Iron lithium magnesium phosphate (Fe0.9LiMg0.1(PO4)) 349632-79-7P, Calcium iron lithium phosphate (Ca0.1Fe0.9Li(PO4)) 349632-82-2P, Iron lithium zinc phosphate (Fe0.9LiZn0.1(PO4))
(prepn. of lithium-contg. materials for **battery cathodes**)

IT 546-89-4, Lithium acetate 553-91-3, Lithium oxalate 554-13-2, Lithium carbonate 1305-62-0, Calcium hydroxide, reactions 1309-37-1, Ferric oxide, reactions 1309-42-8, Magnesium hydroxide 1314-62-1, Vanadium pentoxide, reactions 1317-61-9, iron oxide

fe3o4, reactions 7440-44-0, Carbon, reactions 7722-76-1, Ammonium dihydrogen phosphate 7783-28-0, Diammonium hydrogen phosphate 7790-69-4, Lithium nitrate 7803-55-6, Ammonium vanadate 10045-86-0, iron phosphate fepo4 10377-52-3, Lithium phosphate 11126-15-1, Lithium vanadium oxide 12036-21-4, Vanadium dioxide 12057-24-8, Lithia, reactions 13453-80-0, Lithium dihydrogen phosphate 15060-59-0, lithium vanadium oxide livo3
(prepn. of lithium-contg. materials for **battery cathodes**)

IT 15365-14-7P, iron lithium phosphate FeLiPO4
(prepn. of lithium-contg. materials for **battery cathodes**)

L54 ANSWER 8 OF 16 HCA COPYRIGHT 2002 ACS

131:324968 Improvement of discharge capacity of .beta.-Fe2(SO4)3-type Li3V2(PO4)3 by stabilizing high temperature orthorhombic phase at room temperature. Ohkawa, Hirokazu; Yoshida, Kenji; Saito, Mai; Uematsu, Kazuyoshi; Toda, Kenji; Sato, Mineo (Department of Chemistry and Chemical Engineering, Faculty of Engineering, Niigata University, Niigata, 950-2181, Japan). Chemistry Letters (10), 1017-1018 (English) 1999. CODEN: CMLTAG. ISSN: 0366-7022. Publisher: Chemical Society of Japan.

AB The **cathode** performance of a lithium ion **battery** was investigated for .beta.-Fe2(SO4)3-type Li3V2(PO4)3 and Li3(V1-xZrx)2(PO4)3 (x=0.05, 0.1, 0.15, 0.2). On TG-DTA measurements, Li3V2(PO4)3 exhibited two types of phase transition, while Li3(V1-xZrx)2(PO4)3 exhibited no phase transition. Powder X-ray diffraction anal. and **cond**. measurements confirmed an evidence for the stabilization of the high temp. phase at room temp. The discharge capacity of the Zr-substituted Li3(V1-xZrx)2(PO4)3 samples became much larger than that of the pure Li3V2(PO4)3 sample.

IT **204653-30-5**, Lithium vanadium phosphate Li3V2(PO4)3
(improvement of discharge capacity of .beta.-Fe2(SO4)3-type Li3V2(PO4)3 by stabilizing high temp. orthorhombic phase at room temp.)

RN 204653-30-5 HCA

CN Lithium vanadium phosphate (Li3V2(PO4)3) (9CI) (CA INDEX NAME)

Component	Ratio	Component Registry Number
O4P	3	14265-44-2
V	2	7440-62-2
Li	3	7439-93-2

CC 52-2 (Electrochemical, Radiational, and Thermal Energy Technology)

ST **battery cathode** lithium vanadium phosphate

IT **Battery cathodes**
Ionic **conductivity**
Structural phase transition

(improvement of discharge capacity of .beta.-Fe2(SO4)3-type Li3V2(PO4)3 by stabilizing high temp. orthorhombic phase at room temp.)

IT Secondary **batteries**
(lithium; improvement of discharge capacity of .beta.-Fe2(SO4)3-type Li3V2(PO4)3 by stabilizing high temp. orthorhombic phase at room temp.)

IT **204653-30-5**, Lithium vanadium phosphate Li3V2(PO4)3 248263-63-0, Lithium vanadium zirconium phosphate (Li3V1.9Zr0.1(PO4)3) 248263-64-1, Lithium vanadium zirconium phosphate (Li3V1.8Zr0.2(PO4)3) 248263-65-2, Lithium vanadium zirconium phosphate (Li3V1.7Zr0.3(PO4)3) 248263-66-3, Lithium vanadium zirconium phosphate (Li3V1.6Zr0.4(PO4)3)
(improvement of discharge capacity of .beta.-Fe2(SO4)3-type Li3V2(PO4)3 by stabilizing high temp. orthorhombic phase at room temp.)

L54 ANSWER 9 OF 16 HCA COPYRIGHT 2002 ACS
130:314316 New lithium-ion **conductors** based on the NASICON structure. Thangadurai, Venkataraman; Shukla, Ashok K.; Gopalakrishnan, Jagannatha (Solid State and Structural Chemistry Unit, Indian Institure of Science, Bangalore, 560 012, India). Journal of Materials Chemistry, 9(3), 739-741 (English) 1999. CODEN: JMACEP. ISSN: 0959-9428. Publisher: Royal Society of Chemistry.

AB Lithium-ion **conduction** in mixed-metal phosphates, LiMVMIII(PO4)3 [MV=Nb, Ta; MIII=Al, Cr, Fe], possessing the rhombohedral (R3c) NASICON structure has been investigated. Among the phosphates investigated, LiTaAl(PO4)3 exhibits the highest **cond.**, .sigma..apprxeq.1.0.times.10-2 S cm-1 at 350.degree. (Ea=0.47 eV), comparable to the **cond.** of LiTi2(PO4)3. Unlike LiTi2(PO4)3 which contains lithium-**reducible** TiIV, LiTaAl(PO4)3 contains stable TaV and AlIII oxidn. states and hence deserves further attention towards tailoring new lithium-ion **conductors** for application as **electrolytes** in solid state lithium **batteries**.

IT **196612-05-2P**, Iron lithium niobium phosphate FeLiNb(PO4)3 **223618-03-9P**, Aluminum lithium tantalum phosphate (AlLiTa(PO4)3) **223618-07-3P**, Aluminum lithium tantalum phosphate (Al1.1Li1.2Ta0.9(PO4)3)
(lithium-ion **conductors** based on NASICON structure)

RN 196612-05-2 HCA
CN Iron lithium niobium phosphate (FeLiNb(PO4)3) (9CI) (CA INDEX NAME)

Component	Ratio	Component Registry Number
O4P	3	14265-44-2
Nb	1	7440-03-1
Li	1	7439-93-2
Fe	1	7439-89-6

RN 223618-03-9 HCA
CN Aluminum lithium tantalum phosphate (AlLiTa(PO4)3) (9CI) (CA INDEX NAME)

Component	Ratio	Component Registry Number
O4P	3	14265-44-2
Ta	1	7440-25-7
Li	1	7439-93-2
Al	1	7429-90-5

RN 223618-07-3 HCA
CN Aluminum lithium tantalum phosphate (Al1.1Li1.2Ta0.9(PO4)3) (9CI) (CA INDEX NAME)

Component	Ratio	Component Registry Number
O4P	3	14265-44-2
Ta	0.9	7440-25-7
Li	1.2	7439-93-2
Al	1.1	7429-90-5

CC **52-2** (Electrochemical, Radiational, and Thermal Energy Technology)
ST **battery** lithium ion **conductor** Nasicon structure
IT **Battery electrolytes**
Ionic **conductivity**
NASICONs
(lithium-ion **conductors** based on NASICON structure)
IT 19527-80-1P, Lithium zirconium phosphate LiZr2(PO4)3 30622-39-0P, Lithium titanium phosphate LiTi2(PO4)3 161774-34-1P, Iron lithium tantalum phosphate (FeLiTa(PO4)3) **196612-05-2P**, Iron lithium niobium phosphate FeLiNb(PO4)3 **223618-03-9P**, Aluminum lithium tantalum phosphate (AlLiTa(PO4)3) **223618-07-3P**, Aluminum lithium tantalum phosphate (Al1.1Li1.2Ta0.9(PO4)3)
(lithium-ion **conductors** based on NASICON structure)

L54 ANSWER 10 OF 16 HCA COPYRIGHT 2002 ACS
129:97673 Characteristics of 3D framework **cathodes** with (XO4)n- polyanions. Okada, S.; Arai, H.; Asakura, K.; Sakurai, Y.; Yamaki, J.; Nanjundaswamy, K. S.; Padhi, A. K.; Masquelier, C.; Goodenough, J. B. (NTT Integrated Information and Energy Systems Laboratories, Ibaraki, 319-11, Japan). Progress in Batteries & Battery Materials, 16, 302-308 (English) 1997. CODEN: PBBMEF. ISSN: 1099-4467. Publisher: ITE-JEC Press Inc..
AB In an effort to identify alternate NASICON related framework hosts for Li intercalation, we have investigated the synthesis and electrochem. characterization of 3 inexpensive, environmentally benign phosphates contg. Fe and V, viz. Li3Fe2(PO4)3, Li3V2(PO4)3,

and Li3FeV(PO4)3. The compds. are synthesized by a one-step solid state reaction. The redox voltages V4+/V3+ and Fe3+/Fe3+ in these compds. are tech. attractive for Li rechargeable **battery** applications. Moreover, the octahedral-site redox couples V4+/V3+ and V3+/V2+ are sepd. by 2.0 V, and both the Fe3+/Fe2+ and V3+/V2+ redox voltages get **reduced** by 0.8 V on going from the sulfate to the phosphate polyanion.

IT **204653-30-5**, Lithium vanadium phosphate Li3V2(PO4)3
(characteristics of 3D framework **cathodes** with (XO4)n-polyanions)

RN 204653-30-5 HCA

CN Lithium vanadium phosphate (Li3V2(PO4)3) (9CI) (CA INDEX NAME)

Component	Ratio	Component Registry Number
O4P	3	14265-44-2
V	2	7440-62-2
Li	3	7439-93-2

CC 52-2 (Electrochemical, Radiational, and Thermal Energy Technology)

ST **battery cathode** phosphate polyanion

IT **Battery cathodes**
(characteristics of 3D framework **cathodes** with (XO4)n-polyanions)

IT 36058-25-0, Iron lithium phosphate Fe2Li3(PO4)3 186131-68-0, Iron lithium vanadiumphosphate FeLi3V(PO4)3 **204653-30-5**, Lithium vanadium phosphate Li3V2(PO4)3
(characteristics of 3D framework **cathodes** with (XO4)n-polyanions)

L54 ANSWER 11 OF 16 HCA COPYRIGHT 2002 ACS

129:20826 New **cathode** materials for rechargeable lithium **batteries**: the 3-D framework structures Li3Fe2(XO4)3 (X = P, As). Masquelier, C.; Padhi, A. K.; Nanjundaswamy, K. S.; Goodenough, J. B. (Center for Materials Science and Engineering, University of Texas at Austin, Austin, TX, 78712-1063, USA). Journal of Solid State Chemistry, 135(2), 228-234 (English) 1998. CODEN: JSSCBI. ISSN: 0022-4596. Publisher: Academic Press.

AB Electrochem. insertion of lithium into four Li3Fe2(XO4)3 polymorphs (X = P or As) with 3-D framework structures was carried out in "Li/LiClO4 (PC:DME)/**cathode**" coin cells. Approx. 2 Li per formula unit could be reversibly inserted into the three different structures, which corresponds to the **redn**. of all Fe3+ to Fe2+ between 2.5 and 3.5 V vs lithium. The position of the Fe3+/Fe2+ redox couple below the lithium-anode Fermi energy is nearly independent of the structure and of whether X = P or As. There is, however, a clear dependence of (i) the shape of the Vcc vs x curves for Li3+xFe2(XO4)3 and (ii) the charge-discharge rate capabilities on the crystal structure of the **cathode** material.

IT **198782-41-1**, Iron lithium phosphate (Fe2Li3-5(PO4)3)

(new **cathode** materials for rechargeable lithium **batteries**: 3-D framework structures Li3Fe2(XO4)3 (X = P, As))

RN 198782-41-1 HCA
CN Iron lithium phosphate (Fe2Li3-5(PO4)3) (9CI) (CA INDEX NAME)

Component	Ratio	Component Registry Number
O4P	3	14265-44-2
Li	3 - 5	7439-93-2
Fe	2	7439-89-6

CC **72-2** (Electrochemistry)
Section cross-reference(s): **52**, 56
ST rechargeable lithium **battery cathode** electrochem insertion; ionic **conductor** iron phosphate arsenate structure
IT Electric charge
(electrochem. charge-discharge curves for the first cycle of lithium iron phosphate/arsenate **cathodes**)
IT Current density
(in comparison of capacities for polymorphs Li3Fe2(PO4)3 **cathode** materials for rechargeable lithium **batteries**)
IT Carbon black, uses
(in formation of Li3Fe2(XO4)3 (X = P, As) **cathode** for rechargeable lithium **batteries**)
IT Fluoropolymers, uses
(in formation of Li3Fe2(XO4)3 (X = P, As) **cathode** for rechargeable lithium **batteries**)
IT **Battery cathodes**
Secondary **batteries**
(new **cathode** materials for rechargeable lithium **batteries**: 3-D framework structures Li3Fe2(XO4)3 (X = P, As))
IT Oxidation, electrochemical
(of Fe2+ in lithium iron phosphate and arsenate **cathodes**)
IT **Reduction**, electrochemical
(of Fe3+ in lithium iron phosphate and arsenate **cathodes**)
IT 16986-74-6
(as **cathode** materials for rechargeable lithium **batteries**)
IT 16570-18-6
(**cathode** materials for rechargeable lithium **batteries**)
IT 207733-44-6, Iron lithium phosphate (Fe2Li5(PO4)3)
(electrochem. formation: new **cathode** materials for rechargeable lithium **batteries**)
IT 207733-39-9, Iron lithium phosphate (Fe2Li4(PO4)3)

(electrochem. formation: new **cathode** materials for rechargeable lithium **batteries**)

IT 9002-84-0, PTFE
(in formation of Li3Fe2(XO4)3 (X = P, As) **cathode** for rechargeable lithium **batteries**)

IT 36058-25-0P 101324-14-5P
(monoclinic and rhombohedral; as new **cathode** materials for rechargeable lithium **batteries**; lithium electrochem., intercalation/deintercalation by)

IT **198782-41-1**, Iron lithium phosphate (Fe2Li3-5(PO4)3)
(new **cathode** materials for rechargeable lithium **batteries**: 3-D framework structures Li3Fe2(XO4)3 (X = P, As))

IT 207733-37-7, Iron lithium arsenate (Fe2Li3-4.8(AsO4)3)
(new **cathode** materials for rechargeable lithium **batteries**: electrochem. formation of)

L54 ANSWER 12 OF 16 HCA COPYRIGHT 2002 ACS

128:117313 Molded electrodes for lithium **batteries**. Takata, Kazunori; Iwamoto, Kazuya; Kondo, Shigeo; Takeuchi, Yasumasa; Masaka, Fusazumi; Ishikawa, Katsuhiro (Matsushita Electric Industrial Co., Ltd., Japan; Japan Synthetic Rubber Co., Ltd.). Jpn. Kokai Tokkyo Koho JP 10003926 A2 19980106 Heisei, 13 pp. (Japanese). CODEN: JKXXAF. APPLICATION: JP 1996-154621 19960614.

AB The electrodes contain polymers, which have SO3 or SO3-electron donor adduct attached to C:C double bonds in the polymer mol. and can be electrochem. oxidized and **reduced** in a Li+ **conductive electrolyte**.

IT **120479-61-0**, Aluminum lithium titanium phosphate [Al0.3Li1.3Ti1.7(PO4)3]
(binders from polymers contg. sulfur trioxide or sulfur trioxide-electron donor adduct on double bonds for secondary lithium **battery** electrodes)

RN 120479-61-0 HCA

CN Aluminum lithium titanium phosphate (Al0.3Li1.3Ti1.7(PO4)3) (9CI) (CA INDEX NAME)

Component	Ratio	Component Registry Number
O4P	3	14265-44-2
Ti	1.7	7440-32-6
Li	1.3	7439-93-2
Al	0.3	7429-90-5

IC ICM H01M004-62
ICS H01M010-40

CC **52-2** (Electrochemical, Radiational, and Thermal Energy Technology)

ST lithium **battery** electrode sulfur trioxide polymer; **battery** electrode sulfur trioxide contg polymer

IT **Battery** electrodes

(binders from polymers contg. sulfur trioxide or sulfur trioxide-electron donor adduct on double bonds for secondary lithium **battery** electrodes)

IT EPDM rubber
(reaction products with sulfur trioxide-dioxane adducts; binders from polymers contg. sulfur trioxide or sulfur trioxide-electron donor adduct on double bonds for secondary lithium **battery** electrodes)

IT 123-91-1D, Dioxane, sulfur trioxide adducts, reaction products with double bond contg. polymers 7446-11-9D, Sulfur trioxide, reaction products with double bond contg. polymers, uses 7782-42-5, Graphite, uses 9003-55-8D, Butadiene-styrene copolymer, reaction products with sulfur trioxide-dioxane adducts 11113-63-6, Graphite fluoride 12031-65-1, Lithium nickel oxide (LiNiO2) 12057-17-9, Lithium manganese oxide (LiMn2O4) 12190-79-3, Cobalt lithium oxide (CoLiO2) 25034-71-3D, Dicyclopentadiene-ethylene-propylene copolymer, reaction products with sulfur trioxide-dioxane adducts 25038-32-8D, Isoprene-styrene copolymer, reaction products with sulfur trioxide-dioxane adducts **120479-61-0**, Aluminum lithium titanium phosphate [Al0.3Li1.3Ti1.7(PO4)3]
(binders from polymers contg. sulfur trioxide or sulfur trioxide-electron donor adduct on double bonds for secondary lithium **battery** electrodes)

IT 201471-17-2, Lithium phosphate sulfide thiosilicate (Li1.29(PO4)0.01S0.27(SiS3)0.36) 201471-18-3, Lithium oxide sulfide thiosilicate (Li1.24O0.05S0.19(SiS3)0.38)
(solid **electrolytes** in secondary lithium **battery** electrodes)

IT 105729-79-1D, Isoprene-styrene block copolymer, reaction products with sulfur trioxide-dioxane adducts
(triblock; binders from polymers contg. sulfur trioxide or sulfur trioxide-electron donor adduct on double bonds for secondary lithium **battery** electrodes)

L54 ANSWER 13 OF 16 HCA COPYRIGHT 2002 ACS

117:61381 Lithium insertion in vanadyl phosphate. Pozas, R.; Madueno, S.; Bruque, S.; Moreno-Real, L.; Martinez-Lara, M.; Criado, C.; Ramos-Barrado, J. (Dep. Quim. Inorg., Univ. Malaga, Malaga, 29071, Spain). Solid State Ionics, 51(1-2), 79-83 (English) 1992. CODEN: SSIOD3. ISSN: 0167-2738.

AB The reaction between LiNO3 and VOPO4.2H2O in Me2CO medium takes place, besides a redox process, by an acid-basic reaction. The material obtained, Li1.6VOPO4.**H2O**, is a **non**-homogeneous solid, which is converted to a cryst. solid if annealed at 450.degree.. The existence of Li+ within the intracryst. spaces of Li intercalate as well as the partial **redn.** of V(V) to V(IV) leads to a mixed ionic-electronic **conductor**. This fact is confirmed by the impedance spectroscopy study. Li1.6VOPO4.H2O was characterized by x-ray powder diffractometry, spectroscopy (IR, UV/visible/near-IR diffuse reflectance), and elec. **cond.**

IT **142445-14-5P**

(prepn. and ionic-electronic **cond.** of intercalation compd.)

RN 142445-14-5 HCA

CN Lithium vanadium oxide phosphate (Li1.6VO(PO4)), monohydrate (9CI) (CA INDEX NAME)

CM 1

CRN 142445-13-4
CMF Li . O4 P . O . V
CCI TIS

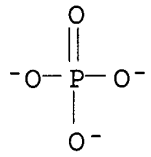
CM 2

CRN 17778-80-2
CMF O

O

CM 3

CRN 14265-44-2
CMF O4 P



CM 4

CRN 7440-62-2
CMF V

V

CM 5

CRN 7439-93-2
CMF Li

Li

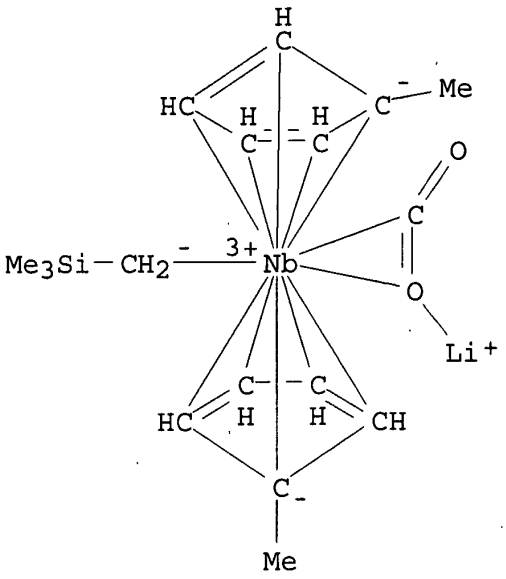
CC 78-3 (Inorganic Chemicals and Reactions)

Section cross-reference(s): 76
ST ionic electronic **conductor** lithium vanadyl phosphate
IT Electric **conductivity** and **conduction**
(electronic-ionic, of lithium vanadium(IV/V) oxide phosphate)
IT **142445-14-5P**
(prepn. and ionic-electronic **cond.** of intercalation compd.)

L54 ANSWER 14 OF 16 HCA COPYRIGHT 2002 ACS
117:48781 Lewis acid-promoted decarbonylation of coordinated carbon dioxide: reactions of (.eta.5-MeC5H4)2Nb(.eta.2-CO2)CH2SiMe3 with Lewis acids. Fu, Peng Fei; Khan, Masood A.; Nicholas, Kenneth M. (Dep. Chem. Biochem., Univ. Oklahoma, Norman, OK, 73019, USA). Organometallics, 11(7), 2607-13 (English) 1992. CODEN: ORGND7. ISSN: 0276-7333.
AB The interaction of Cp'2Nb(.eta.2-CO2)CH2SiMe3 (1; Cp' = .eta.5-MeC5H4) with several Lewis acids has been studied and found to result in facile decarbonylation of 1; the Nb-contg. products depend markedly on the Lewis acid partner. Reaction of 1 with LiPF6 or BF3.Et2O causes both decarbonylation and **deoxygenation**, producing [Cp'2Nb(F)CH2SiMe3]Z [Z = PF6- (3), BF4-], which have been characterized spectroscopically and (for 3) by x-ray diffraction; 3 is also produced in the reaction of the oxo deriv. Cp'2Nb(O)CH2SiMe3 (2) with LiPF6 or BF3.Et2O. 1 Reacts with ZnCl2 first to form an adduct, Cp'2Nb(CO2)CH2SiMe3.ZnCl2 (7), which based on IR and NMR data appears to have a novel .mu.-CO2 unit bridging Nb and Zn. Complex 7 is unstable, decompg. with CO loss to form [Cp'2Nb(CH2SiMe3)O.ZnCl2]2 (8), an adduct of ZnCl2 with the oxo species 2, which has been characterized crystallog.; 8 is also produced from 2 and ZnCl2. Reaction of 1 with HgCl2 rapidly produces an incompletely characterized product, which has been both decarbonylated and dealkylated. Although CdCl2 does not react with 1 under comparable conditions, Me3SiCl reacts rapidly with 1 to produce Cp'2Nb(O)Cl (11), resulting from decarbonylation and dealkylation; the structure of 11 has been established by x-ray diffraction.
IT **142066-82-8P**
(prepn., IR spectrum, and decompn. of)
RN 142066-82-8 HCA
CN Lithium(1+), [bis[(1,2,3,4,5-.eta.)-1-methyl-2,4-cyclopentadien-1-yl][(trimethylsilyl)methyl]niobium][.mu.-[(C,O-.eta.)-carbon dioxide-O']]-, hexafluorophosphate(1-) (9CI) (CA INDEX NAME)

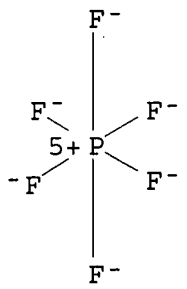
CM 1

CRN 142066-81-7
CMF C17 H25 Li Nb O2 Si
CCI CCS



CM 2

CRN 16919-18-9
CMF F6 P
CCI CCS



CC 29-10 (Organometallic and Organometalloidal Compounds)
Section cross-reference(s): 75
IT **142066-82-8P**
(prepn., IR spectrum, and decompn. of)

L54 ANSWER 15 OF 16 HCA COPYRIGHT 2002 ACS
115:265266 Intercalation in 3D-skeleton structures: ionic and electronic features. Hagenmuller, Paul; Delmas, Claude (Lab. Chimie Solide, Univ. Bordeaux I, Talence, 33405, Fr.). Materials Research Society Symposium Proceedings, 210(Solid State Ionics 2), 323-34 (English) 1991. CODEN: MRSPDH. ISSN: 0272-9172.

AB The voltage of an **electrochem. cell**, i.e. the difference between the chem. potentials of the two electrodes, may play the role of a sensor which allows to display the structural modifications and the phys. properties. The electrochem. processes involved in an alkali metal (A) intercalation electrode emphasize the influence of the ionic and/or electronic features. The A+-lattice and A+-A+ interactions as well as electronic band-filling may lead to phase transitions or even limit the intercalation reaction. The shape of the cell voltage vs. intercalation rate curve depends on the no. of vacant sites available for intercalation, the no. and the oxidn. state of the **reducible** cations, the band structure of the material and the covalency of the framework. Alkali ion intercalation in 3D-structures related to perovskite (Ln1/3NbO3), hexagonal tungsten bronze (LiW3O9F) and Nasicon-type (AM2(PO4)3) is discussed from that point of view. In Ln1/3NbO3 (Ln = La, Nd) (i.e. .box. 1/2Ln1/3.box.'1/6NbO3) Li+ intercalation in various sites is related to the rare earth size. Two extra lithium atoms can be introduced into LiW3O9F in which four sites are available, but only one out of two is occupied in order to **reduce** the electrostatic interactions. Moreover the change in the discharge curves can be assocd. to the modifications with intercalation rate of the Li+-lattice interactions. Within the Nasicon derived structures of ATi2(PO4)3 and Fe2(MoO4)3 the intercalation process is limited by the lowest stable oxidn. state of titanium or iron. In both systems the strong electronic localization leads to formation of large two phase-domains. The relevance of using 3D-intercalation electrodes in electrochem. power **batteries** will be discussed as for factors such as elec. behavior or absence of significant unit cell modifications of the **pos. electrodes** during the intercalation process are essential for many cycle utilizations.

IT **119536-20-8**, Lithium titanium phosphate (Li1-3Ti2(PO4)3)
(charging and discharging of, intercalation in relation to)

RN 119536-20-8 HCA

CN Lithium titanium phosphate (Li1-3Ti2(PO4)3) (9CI) (CA INDEX NAME)

Component	Ratio	Component Registry Number
O4P	3	14265-44-2
Ti	2	7440-32-6
Li	1 - 3	7439-93-2

CC 72-2 (Electrochemistry)
Section cross-reference(s): 78

IT **119536-20-8**, Lithium titanium phosphate (Li1-3Ti2(PO4)3)
119536-21-9, Sodium titanium phosphate (Na1-3Ti2(PO4)3)
(charging and discharging of, intercalation in relation to)

L54 ANSWER 16 OF 16 HCA COPYRIGHT 2002 ACS

110:123586 The NASICON-type titanium phosphates ATi2(PO4)3 (A = lithium, sodium) as electrode materials. Delmas, C.; Nadiri, A.; Soubeyroux,

J. L. (Lab. Chim. Solide, Univ. Bordeaux I, Talence, 33405, Fr.). Solid State Ionics, Volume Date 1987, 28-30(Pt. 1), 419-23 (English) 1988. CODEN: SSIOD3. ISSN: 0167-2738.

AB Li and Na were intercalated in LiTi2(PO4)3 and NaTi2(PO4)3, resp.. Despite the low electronic **cond.** of the Nasicon framework the intercalation can be realized either chem. or electrochem. The electrochem. study shows the reversibility of the process and the existence of large biphased domains in both systems. The obsd. phase sepn. reactions result from Li+(Na+) and e- migration without skeleton bond breaking and recombination. The large hexagonal c-parameter of Li3Ti2(PO4)3 results from a peculiar Li ion distribution (M(1) empty, M(2) fully occupied) as shown by neutron diffraction.

IT **119536-20-8P**, Lithium titanium phosphate (Li1-3Ti2(PO4)3)
119536-22-0P, Lithium titanium phosphate (Li2.72Ti2(PO4)3)
119536-23-1P, Lithium titanium phosphate (Li1-3.3Ti2(PO4)3)
(formation of, electrochem.)

RN 119536-20-8 HCA
CN Lithium titanium phosphate (Li1-3Ti2(PO4)3) (9CI) (CA INDEX NAME)

Component	Ratio	Component Registry Number
O4P	3	14265-44-2
Ti	2	7440-32-6
Li	1 - 3	7439-93-2

RN 119536-22-0 HCA
CN Lithium titanium phosphate (Li2.72Ti2(PO4)3) (9CI) (CA INDEX NAME)

Component	Ratio	Component Registry Number
O4P	3	14265-44-2
Ti	2	7440-32-6
Li	2.72	7439-93-2

RN 119536-23-1 HCA
CN Lithium titanium phosphate (Li1-3.3Ti2(PO4)3) (9CI) (CA INDEX NAME)

Component	Ratio	Component Registry Number
O4P	3	14265-44-2
Ti	2	7440-32-6
Li	1 - 3.3	7439-93-2

CC **72-2** (Electrochemistry)
Section cross-reference(s): 76, 78

IT **119536-20-8P**, Lithium titanium phosphate (Li1-3Ti2(PO4)3)
119536-21-9P, Sodium titanium phosphate (Na1-3Ti2(PO4)3)
119536-22-0P, Lithium titanium phosphate (Li2.72Ti2(PO4)3)

119536-23-1P, Lithium titanium phosphate (Li1-3.3Ti2(PO4)3)
(formation of, electrochem.)
IT 109-72-8, Butyl lithium, reactions
(**redn**. by, of lithium titanium phosphate, lithium intercalation in relation to)
IT 3481-12-7, Naphthalene radical ion(1-) sodium
(**redn**. by, of sodium titanium phosphate, sodium intercalation in relation to)

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L55 ANSWER 1 OF 19 HCA COPYRIGHT 2002 ACS
137:235112 A reversible lithium intercalation process in an ReO3-type structure PNb9O25. Patoux, Sebastien; Dolle, Mickael; Rousse, Gwenaelle; Masquelier, Christian (Laboratoire de Reactivite et de Chimie des Solides, CNRS UMR 6007, Universite de Picardie Jules Verne, Amiens, 80039, Fr.). Journal of the Electrochemical Society, 149(4), A391-A400 (English) 2002. CODEN: JESOAN. ISSN: 0013-4651. Publisher: Electrochemical Society.
AB Among the large family of Wadsley-Roth-type phases, PNb9O25 presents, as other shear structures such as H-Nb2O5, GeNb18O47, and VNb9O25, a peculiar arrangement of 3 .times. 3 .times. .infin. ReO3-type blocks connected through XO4 tetrahedra. The crystal structure was redetd. by combined Rietveld refinements of X-ray and neutron powder diffraction data, for the first time in the tetragonal space group I4 with a = 15.615(1) .ANG. and c = 3.829(1) .ANG.. The electrochem. insertion of lithium into LixPNb9O25 reaches a value of x = 13.5, between 3.0 and 1.0 V vs. Li+/Li at a slow cycling rate. Within this voltage window, in situ X-ray diffraction reveals that the reversible intercalation of lithium occurs through three single- and two two-phase regions. The variation of the lattice parameters as a function of x indicates a global change of .DELTA.V/V = +10% assocd. with the **redn**. of Nb5+ to Nb4+ and then partly to Nb3+. At voltages lower than 1 V vs. Li+/Li, extra irreversible phenomena, such as **electrolyte** and/or carbon **redn**. were identified but, remarkably, highly cryst. particles of LixPNb9O25 remain unaltered when discharging the cell for prolonged time down to 0.02 V vs. Li+/Li. The behavior of LixPNb9O25 is very similar to that of H-LixNb2O5 (LixNbNb9O25) but different to that of LixVNb9O25 where irreversible **redn**. of V5+ to V2+ (in tetrahedral coordination) takes place.
IT **459412-77-2**, Lithium niobium oxide phosphate (Li8.8Nb5O21(PO4)) **459412-78-3**, Lithium niobium oxide phosphate (Li6.3Nb9O21(PO4))
(formation and properties of; reversible lithium intercalation process in an ReO3-type structure PNb9O25 in secondary **batteries**)
RN 459412-77-2 HCA
CN Lithium niobium oxide phosphate (Li8.8Nb5O21(PO4)) (9CI) (CA INDEX NAME)

Component	Ratio	Component Registry Number
O	21	17778-80-2
O4P	1	14265-44-2
Nb	5	7440-03-1
Li	8.8	7439-93-2

RN 459412-78-3 HCA
CN Lithium niobium oxide phosphate (Li6.3Nb9O21(PO4)) (9CI) (CA INDEX NAME)

Component	Ratio	Component Registry Number
O	21	17778-80-2
O4P	1	14265-44-2
Nb	9	7440-03-1
Li	6.3	7439-93-2

CC **52-2** (Electrochemical, Radiational, and Thermal Energy Technology)
Section cross-reference(s): 75
ST **battery** electrode lithium intercalation rhenium oxide structure; electrochem cycling rhenium oxide lithium **battery** electrode; charging cycling rhenium oxide lithium **battery** electrode
IT Secondary **batteries**
(electrochem. charge-discharge cycling in; reversible lithium intercalation process in an ReO3-type structure PNb9O25 in secondary **batteries**)
IT Intercalation
(electrochem.; reversible lithium intercalation process in an ReO3-type structure PNb9O25 in secondary **batteries**)
IT **Reduction**, electrochemical
(of PNb9O25-type phases; reversible lithium intercalation process in an ReO3-type structure PNb9O25 in secondary **batteries**)
IT Crystal structure
(of lithium-intercalated PNb9O25-type phases; reversible lithium intercalation process in an ReO3-type structure PNb9O25 in secondary **batteries**)
IT **Battery** electrodes
(reversible lithium intercalation process in an ReO3-type structure PNb9O25 in secondary **batteries**)
IT 12035-14-2, Niobium oxide phosphate (Nb9O21(PO4))
(**battery** electrodes; reversible lithium intercalation process in an ReO3-type structure PNb9O25 in secondary **batteries**)
IT 7439-93-2, Lithium, processes 17341-24-1, Lithium(1+), processes
(electrochem. incorporation of; reversible lithium intercalation

process in an ReO3-type structure PNb9O25 in secondary **batteries**)

IT 12035-15-3, Niobium vanadium oxide (Nb9VO25) 12065-02-0, Germanium niobium oxide (GeNb18O47) 407630-24-4, Niobium hydroxide oxide (Nb2(OH)O4)
(electrochem. insertion of Li+ in; reversible lithium intercalation process in an ReO3-type structure PNb9O25 in secondary **batteries**)

IT 22537-41-3, Niobium(5+), processes
(electrochem. **redn**. of; reversible lithium intercalation process in an ReO3-type structure PNb9O25 in secondary **batteries**)

IT 15473-95-7, processes 22541-83-9, Niobium(3+), processes
(formation and electrochem. **redn**. of; reversible lithium intercalation process in an ReO3-type structure PNb9O25 in secondary **batteries**)

IT **459412-77-2**, Lithium niobium oxide phosphate (Li8.8Nb5O21(PO4)) **459412-78-3**, Lithium niobium oxide phosphate (Li6.3Nb9O21(PO4))
(formation and properties of; reversible lithium intercalation process in an ReO3-type structure PNb9O25 in secondary **batteries**)

L55 ANSWER 2 OF 19 HCA COPYRIGHT 2002 ACS

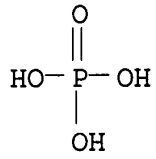
136:404204 A novel concept for the synthesis of an improved LiFePO4 lithium **battery cathode**. Croce, F.; D'Epifanio, A.; Hassoun, J.; Deptula, A.; Olczac, T.; Scrosati, B. (Dipartimento di Chimica, Universita "La Sapienza,", Rome, 00185, Italy). Electrochemical and Solid-State Letters, 5(3), A47-A50 (English) 2002. CODEN: ESLEF6. ISSN: 1099-0062. Publisher: Electrochemical Society.

AB This paper describes the synthesis and the properties of a kinetically improved LiFePO4 **cathode** material. The novel aspect of the synthesis is based on a crit. step involving the dispersion of metal (e.g., copper or silver) at a very low concn. (1 wt%). This metal addn. does not affect the structure of the **cathode** but considerably improves its kinetics in terms of capacity delivery and cycle life. Such an enhancement of the electrochem. properties has been ascribed to a **redn**. of the particle size and to an increase of the bulk intra- and interparticle electronic **cond**. of LiFePO4, both effects being promoted by the finely dispersed metal powders. This improved **cond**. favors the response of LiFePO4, thus substantiating its interest as new **cathode** for advanced lithium ion **batteries**.

IT **15365-14-7P**, Iron lithium phosphate FeLiPO4
(novel concept for synthesis of improved LiFePO4 lithium **battery cathode**)

RN 15365-14-7 HCA

CN Phosphoric acid, iron(2+) lithium salt (1:1:1) (9CI) (CA INDEX NAME)



● Fe(II)

● Li

CC **52-2** (Electrochemical, Radiational, and Thermal Energy Technology)
Section cross-reference(s): 49, **72**
ST synthesis lithium iron phosphate **battery cathode** copper silver powder
IT Electric charge
(charge-discharge cycling of LiFePO4 lithium **battery cathode** in EC/DEC contg. LiClO4)
IT Secondary **batteries**
(lithium; novel concept for synthesis of improved LiFePO4 lithium **battery cathode**)
IT **Battery cathodes**
Sol-gel processing
Synthesis
(novel concept for synthesis of improved LiFePO4 lithium **battery cathode**)
IT Particle size
(of improved LiFePO4 lithium **battery cathode** formed by sol=gel processing)
IT Microstructure
(of improved LiFePO4 with added copper or silver powder lithium **battery cathode**)
IT 96-49-1, Ethylene carbonate 105-58-8, Diethyl carbonate 7791-03-9, Lithium perchlorate
(charge-discharge cycling of LiFePO4 lithium **battery cathode** in EC/DEC contg. LiClO4)
IT 7440-22-4, Silver, uses 7440-50-8, Copper, uses
(fine powder; use in synthesis of improved LiFePO4 lithium **battery cathode**)
IT **15365-14-7P**, Iron lithium phosphate FeLiPO4
(novel concept for synthesis of improved LiFePO4 lithium **battery cathode**)
IT 50-81-7, Ascorbic acid, reactions 1310-65-2, Lithium hydroxide 7664-38-2, Phosphoric acid, reactions 10421-48-4
(use in synthesis of improved LiFePO4 lithium **battery**

cathode)

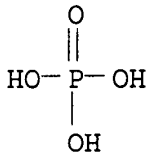
L55 ANSWER 3 OF 19 HCA COPYRIGHT 2002 ACS
136:388549 Reticulated and controlled porosity **battery** structures. Chiang, Yet-Ming; Hellweg, Benjamin (Massachusetts Institute of Technology, USA). PCT Int. Appl. WO 2002043168 A2 20020530, 44 pp. DESIGNATED STATES: W: AE, AG, AL, AM, AT, AU, AZ, BA, BB, BG, BR, BY, BZ, CA, CH, CN, CO, CR, CU, CZ, DE, DK, DM, DZ, EC, EE, ES, FI, GB, GD, GE, GH, GM, HR, HU, ID, IL, IN, IS, JP, KE, KG, KP, KR, KZ, LC, LK, LR, LS, LT, LU, LV, MA, MD, MG, MK, MN, MW, MX, MZ, NO, NZ, PH, PL, PT, RO, RU, SD, SE, SG, SI, SK, SL, TJ, TM, TR, TT, TZ, UA, UG, UZ, VN, YU, ZA, ZW, AM, AZ, BY, KG, KZ, MD, RU, TJ, TM; RW: AT, BE, BF, BJ, CF, CG, CH, CI, CM, CY, DE, DK, ES, FI, FR, GA, GB, GR, IE, IT, LU, MC, ML, MR, NE, NL, PT, SE, SN, TD, TG, TR. (English). CODEN: PIXXD2. APPLICATION: WO 2001-US48345 20011022. PRIORITY: US 2000-PV242124 20001020.

AB The effective ionic **cond**. in a composite structure is believed to decrease rapidly with vol. fraction. A system, such as a bipolar device or energy storage device, has structures or components in which the diffusion length or path that electrodes or ions must traverse is minimized and the interfacial area exposed to the ions or electrons is maximized. The device includes components that can be reticulated or has a reticulated interface so that an interface area can be increased. The increased interfacial perimeter increases the available sites for reaction of ionic species. Many different reticulation patterns can be used. The aspect ratio of the reticulated features can be varied. Such bipolar devices can be fabricated by a variety of methods or procedures. A bipolar device having structures of reticulated interface can be tailored for the purposes of controlling and optimizing charge and discharge kinetics. A bipolar device having graded porosity structures can have improved transport properties because the diffusion controlling reaction kinetics can be modified. Graded porosity electrodes can be linearly or nonlinearly graded. A bipolar device having perforated structures also provides improved transport properties by removing tortuosity and **reducing** diffusion distance.

IT **15365-14-7**, Iron lithium phosphate felipo4 (reticulated and controlled porosity **battery** structures)

RN 15365-14-7 HCA

CN Phosphoric acid, iron(2+) lithium salt (1:1:1) (9CI) (CA INDEX NAME)



● Fe(II)

● Li

IC ICM H01M004-00
CC **52-2** (Electrochemical, Radiational, and Thermal Energy Technology)
ST **battery** structure reticulated controlled porosity
IT Vapor deposition process
(chem.; reticulated and controlled porosity **battery** structures)
IT Sedimentation (separation)
(differential; reticulated and controlled porosity **battery** structures)
IT Polyoxyalkylenes, uses
(lithium complexes; reticulated and controlled porosity **battery** structures)
IT **Battery cathodes**
Evaporation
Porosity
Screen printing
Secondary **batteries**
Sputtering
Surface area
Web materials
(reticulated and controlled porosity **battery** structures)
IT Fluoropolymers, uses
(reticulated and controlled porosity **battery** structures)
IT Molding
(tape-casting; reticulated and controlled porosity **battery** structures)
IT Coating process
(web; reticulated and controlled porosity **battery** structures)
IT 91-20-3, Naphthalene, uses
(pore former; reticulated and controlled porosity **battery**

structures)
IT 96-49-1, Ethylene carbonate 616-38-6, Dimethyl carbonate 7429-90-5, Aluminum, uses 7439-93-2D, Lithium, polyethylene oxide complex 7440-22-4, Silver, uses 7440-31-5, Tin, uses 7440-36-0, Antimony, uses 7440-44-0, Carbon, uses 7440-66-6, Zinc, uses 12031-65-1, Lithium nickel oxide linio2 12057-17-9, Lithium manganese oxide limn2o4 12057-30-6 12162-79-7, Lithium manganese oxide limno2 12190-79-3, Cobalt lithium oxide colio2 12798-95-7 **15365-14-7**, Iron lithium phosphate felipo4 25322-68-3D, Peo, lithium complexes 144419-56-7, Cobalt lithium magnesium oxide Co0.95LiMg0.05O2
(reticulated and controlled porosity **battery** structures)
IT 1314-62-1, Vanadium pentoxide, uses 12338-02-2
(reticulated and controlled porosity **battery** structures)
IT 24937-79-9, Pvdf
(reticulated and controlled porosity **battery** structures)

L55 ANSWER 4 OF 19 HCA COPYRIGHT 2002 ACS
136:312584 Method for preparation of **cathode** active material for **nonaqueous** lithium secondary **battery**. Sato, Atsushi; Kuyama, Junji; Fukushima, Yuzuru; Hosoya, Mamoru (Sony Corp., Japan). Eur. Pat. Appl. EP 1198019 A2 20020417, 15 pp. DESIGNATED STATES: R: AT, BE, CH, DE, DK, ES, FR, GB, GR, IT, LI, LU, NL, SE, MC, PT, IE, SI, LT, LV, FI, RO. (English). CODEN: EPXXDW. APPLICATION: EP 2001-123899 20011005. PRIORITY: JP 2000-308299 20001006.
AB A **nonaq. electrolyte cell** includes a **cathode** contg. a **cathode** active material, which is mainly composed of a compd. represented by the general formula LixFePO4, where 0 < x .ltoreq. 1, with the molar ratio of Li3PO4 to a compd. represented by the general formula LixFePO4, which ratio is represented by Li3PO4/LiFePO4, being Li3PO4/LiFePO4 .ltoreq. 6.67 .times. 10-2. Starting materials for the synthesis of compd. LixFePO4 where 0 < x .ltoreq. 1 are Li3PO4 and Fe3(PO4)2 or Fe3(PO4)2.nH2O when n denotes a no. of hydrates.
IT **198782-39-7P**, Iron lithium phosphate (FeLi0-1(PO4))
(method for prepn. of **cathode** active material for **nonaq.** lithium secondary **battery**)
RN 198782-39-7 HCA
CN Iron lithium phosphate (FeLi0-1(PO4)) (9CI) (CA INDEX NAME)

Component	Ratio	Component Registry Number
O4P	1	14265-44-2
Li	0 - 1	7439-93-2
Fe	1	7439-89-6

IC ICM H01M004-58

ICS H01M010-40
CC **52-2** (Electrochemical, Radiational, and Thermal Energy Technology)
ST lithium **nonaq** secondary **battery cathode** prepn
IT Secondary **batteries**
(lithium; method for prepn. of **cathode** active material for **nonaq**. lithium secondary **battery**)
IT **Battery cathodes**
Battery electrolytes
(method for prepn. of **cathode** active material for **nonaq**. lithium secondary **battery**)
IT Fluoropolymers, uses
(method for prepn. of **cathode** active material for **nonaq**. lithium secondary **battery**)
IT 10028-23-6, Phosphoric acid, iron(2+) salt (2:3)octahydrate 10377-52-3, Trilithium phosphate 14940-41-1, Iron phosphate fe3(po4)2 31096-55-6, Phosphoric acid, iron(2+) salt (2:3) hydrate
(method for prepn. of **cathode** active material for **nonaq**. lithium secondary **battery**)
IT 108-32-7, Propylene carbonate 616-38-6, Dimethyl carbonate 7782-42-5, Graphite, uses 21324-40-3, Lithium hexafluorophosphate
(method for prepn. of **cathode** active material for **nonaq**. lithium secondary **battery**)
IT **198782-39-7P**, Iron lithium phosphate (FeLi0-1(PO4))
(method for prepn. of **cathode** active material for **nonaq**. lithium secondary **battery**)
IT 9011-17-0, Hexafluoropropylene-vinylidene fluoride copolymer 24937-79-9, Pvdf
(method for prepn. of **cathode** active material for **nonaq**. lithium secondary **battery**)

L55 ANSWER 5 OF 19 HCA COPYRIGHT 2002 ACS
136:297395 Method for fabrication of **cathode** active material and a **nonaqueous electrolyte battery**.
Hosoya, Mamoru; Fukushima, Yuzuru; Sakai, Hidecki; Kuyama, Junji (Sony Corporation, Japan). Eur. Pat. Appl. EP 1195827 A2 20020410, 31 pp. DESIGNATED STATES: R: AT, BE, CH, DE, DK, ES, FR, GB, GR, IT, LI, LU, NL, SE, MC, PT, IE, SI, LT, LV, FI, RO. (English). CODEN: EPXXDW. APPLICATION: EP 2001-123894 20011005. PRIORITY: JP 2000-308300 20001006; JP 2000-308313 20001006.
AB The invention comprises a method for producing a **cathode** active material having superior cell characteristics through single-phase synthesis of a composite material composed of a compd. represented by the general formula LixFe1-yMyPO4 and a carbon material pos. and a method for producing a **non-aq**. **electrolyte cell** employing the so produced **cathode** active material. To this end, the **cathode** active material is prepd. by a step of mixing the starting materials for synthesis of the compd. represented by the general formula LixFe1-yMyPO4, a step of milling a mixt. obtained by the mixing step, a step of compressing the mixt. obtained by the mixing step to

a preset d. and a step of sintering the mixt. obtained by the compressing step. A carbon material is added in any one of the above steps prior to the sintering step. The d. of the mixt. in the compressing step is set to not less than 1.71 g/cm3 and not larger than 2.45 g/cm3.

IT **198782-39-7**, Iron lithium phosphate (FeLi0-1(PO4))
(method for fabrication of **cathode** active material and **nonaq. electrolyte battery**)

RN 198782-39-7 HCA

CN Iron lithium phosphate (FeLi0-1(PO4)) (9CI) (CA INDEX NAME)

Component	Ratio	Component Registry Number
O4P	1	14265-44-2
Li	0 - 1	7439-93-2
Fe	1	7439-89-6

IC ICM H01M004-58
ICS H01M010-40

CC **52-2** (Electrochemical, Radiational, and Thermal Energy Technology)

ST **cathode** active material **nonaq electrolyte battery**

IT Ball milling
Battery cathodes
Composites
Secondary **batteries**
(method for fabrication of **cathode** active material and **nonaq. electrolyte battery**)

IT Carbon black, uses
(method for fabrication of **cathode** active material and **nonaq. electrolyte battery**)

IT 7440-44-0, Carbon, uses **198782-39-7**, Iron lithium phosphate (FeLi0-1(PO4)) 407606-22-8, Chromium iron lithium phosphate (Cr0-0.8Fe0.2-1Li0.05-1.2(PO4)) 407606-24-0, Cobalt iron lithium phosphate (Co0-0.8Fe0.2-1Li0.05-1.2(PO4)) 407606-26-2, Copper iron lithium phosphate (Cu0-0.8Fe0.2-1Li0.05-1.2(PO4)) 407606-28-4, Aluminum iron lithium phosphate (Al0-0.8Fe0.2-1Li0.05-1.2(PO4)) 407606-30-8, Gallium iron lithium phosphate (Ga0-0.8Fe0.2-1Li0.05-1.2(PO4)) 407606-32-0, Boron iron lithium phosphate (B0-0.8Fe0.2-1Li0.05-1.2(PO4)) 407606-34-2, Iron lithium manganese phosphate (Fe0.2-1Li0.05-1.2Mn0-0.8(PO4)) 407606-36-4, Iron lithium nickel phosphate (Fe0.2-1Li0.05-1.2Ni0-0.8(PO4)) 407606-39-7, Iron lithium vanadium phosphate (Fe0.2-1Li0.05-1.2V0-0.8(PO4)) 407606-42-2, Iron lithium molybdenum phosphate (Fe0.2-1Li0.05-1.2Mo0-0.8(PO4)) 407606-44-4, Iron lithium titanium phosphate (Fe0.2-1Li0.05-1.2Ti0-0.8(PO4)) 407606-47-7, Iron lithium zinc phosphate (Fe0.2-1Li0.05-1.2Zn0-0.8(PO4)) 407606-49-9, Iron lithium magnesium phosphate (Fe0.2-1Li0.05-1.2Mg0-0.8(PO4)) 407606-51-3, Iron lithium niobium phosphate (Fe0.2-1Li0.05-1.2Nb0-0.8(PO4)) 407629-87-2 407629-90-7

407629-95-2 407630-01-7 407630-10-8 407630-14-2
(method for fabrication of **cathode** active material and **nonaq. electrolyte battery**)

IT 15365-14-7P, Iron lithium phosphate FeLiPO4
(method for fabrication of **cathode** active material and **nonaq. electrolyte battery**)

IT 9011-17-0, Hexafluoropropylene-vinylidene fluoride copolymer
(method for fabrication of **cathode** active material and **nonaq. electrolyte battery**)

L55 ANSWER 6 OF 19 HCA COPYRIGHT 2002 ACS

136:281939 **Nonaqueous electrolyte battery** **cathode** active material capable of reversibly doping/undoping lithium. Hosoya, Mamoru; Takahashi, Kimio; Fukushima, Yuzuru (Sony Corporation, Japan). Eur. Pat. Appl. EP 1193787 A2 20020403, 16 pp. DESIGNATED STATES: R: AT, BE, CH, DE, DK, ES, FR, GB, GR, IT, LI, LU, NL, SE, MC, PT, IE, SI, LT, LV, FI, RO. (English). CODEN: EPXXDW. APPLICATION: EP 2001-123181 20010927. PRIORITY: JP 2000-301399 20000929.

AB An LiFePO4 carbon composite material is to be synthesized in a single phase to realize superior cell characteristics. To this end, in the prepn. of a **cathode** active material, starting materials for synthesis of a compd. having the formula LixFePO4, where 0 < x .ltoreq. 1, are mixed together, milled and sintered. A carbon material is added at one of these steps. As the starting materials for synthesis for LixFePO4, Li3PO4, Fe3PO4, Fe3(PO4)2 or its hydrate Fe3(PO4)2.cntdot.nH2O, where n is the no. of hydrates, are used, and the content of Fe3+ in the total iron in Fe3(PO4)2 or its hydrate Fe3(PO4)2.cntdot.nH2O is set to 61 wt% or less.

IT **198782-39-7P**, Iron lithium phosphate (FeLi0-1(PO4))
(**nonaq. electrolyte battery** **cathode** active material capable of reversibly doping/undoping lithium)

RN 198782-39-7 HCA

CN Iron lithium phosphate (FeLi0-1(PO4)) (9CI) (CA INDEX NAME)

Component	Ratio	Component Registry Number
O4P	1	14265-44-2
Li	0 - 1	7439-93-2
Fe	1	7439-89-6

IC ICM H01M004-58
ICS H01M010-40

CC **52-2** (Electrochemical, Radiational, and Thermal Energy Technology)

ST **battery cathode** lithium iron phosphate carbon composite

IT Secondary **batteries**
(lithium; **nonaq. electrolyte battery** **cathode** active material capable of reversibly

doping/undoping lithium)
IT Ball milling
Battery cathodes
Composites
Sintering
(**nonaq. electrolyte battery**
cathode active material capable of reversibly
doping/undoping lithium)
IT Carbonaceous materials (technological products)
(**nonaq. electrolyte battery**
cathode active material capable of reversibly
doping/undoping lithium)
IT Fluoropolymers, uses
(**nonaq. electrolyte battery**
cathode active material capable of reversibly
doping/undoping lithium)
IT 10028-23-6, Phosphoric acid, iron(2+) salt (2:3) octahydrate
10045-86-0, Ferric phosphate 10377-52-3, Lithium phosphate li3po4
31096-55-6
(**nonaq. electrolyte battery**
cathode active material capable of reversibly
doping/undoping lithium)
IT 96-49-1, Ethylene carbonate 108-32-7, Propylene carbonate
7439-93-2, Lithium, uses 7440-44-0, Carbon, uses 7782-42-5,
Graphite, uses 9011-17-0, Hexafluoropropylene-vinylidene fluoride
copolymer 15365-14-7, Iron lithium phosphate FeLiPO4 21324-40-3,
Lithium hexafluorophosphate
(**nonaq. electrolyte battery**
cathode active material capable of reversibly
doping/undoping lithium)
IT 24937-79-9, Pvdf
(**nonaq. electrolyte battery**
cathode active material capable of reversibly
doping/undoping lithium)
IT **198782-39-7P**, Iron lithium phosphate (FeLi0-1(PO4))
(**nonaq. electrolyte battery**
cathode active material capable of reversibly
doping/undoping lithium)
IT 872-36-6, Vinylene carbonate
(**nonaq. electrolyte battery**
cathode active material capable of reversibly
doping/undoping lithium)

L55 ANSWER 7 OF 19 HCA COPYRIGHT 2002 ACS
136:281938 **Nonaqueous electrolyte battery**
cathode active material capable of reversibly
doping/undoping lithium. Hosoya, Mamoru; Takahashi, Kimio;
Fukushima, Yuzuru (Sony Corporation, Japan). Eur. Pat. Appl. EP
1193786 A2 20020403, 15 pp. DESIGNATED STATES: R: AT, BE, CH, DE,
DK, ES, FR, GB, GR, IT, LI, LU, NL, SE, MC, PT, IE, SI, LT, LV, FI,
RO. (English). CODEN: EPXXDW. APPLICATION: EP 2001-123180
20010927. PRIORITY: JP 2000-301401 20000929.

AB A LiFePO4 carbon composite material is to be synthesized in a single phase satisfactorily to achieve superior cell characteristics. In prepg. a **cathode** active material, starting materials for synthesis of a compd. represented by the general formula LixFePO4, where 0 < x .ltoreq. 1, are mixed, milled and a carbon material is added to the resulting mass at an optional time point in the course of mixing, milling and sintering. Li3PO4, Fe3(PO4)2 or its hydrates Fe3(PO4)2.cntdot.nH2O, where n denotes the no. of hydrates, are used as the starting materials for synthesis of LixFePO4. The temp. of a product from the sintering is set to 305.degree. or less when the product from the sintering is exposed to atm. The oxygen concn. in a sintering atm. is set to 1012 ppm in vol. or less at the time point of sintering.

IT **198782-39-7P**, Iron lithium phosphate (FeLi0-1(PO4))
(**nonaq. electrolyte battery**
cathode active material capable of reversibly doping/undoping lithium)

RN 198782-39-7 HCA

CN Iron lithium phosphate (FeLi0-1(PO4)) (9CI) (CA INDEX NAME)

Component	Ratio	Component Registry Number
O4P	1	14265-44-2
Li	0 - 1	7439-93-2
Fe	1	7439-89-6

IC ICM H01M004-58
ICS H01M010-40

CC **52-2** (Electrochemical, Radiational, and Thermal Energy Technology)

ST **battery cathode** lithium iron phosphate carbon composite

IT Secondary **batteries**
(lithium; **nonaq. electrolyte battery**
cathode active material capable of reversibly doping/undoping lithium)

IT **Battery cathodes**
Composites
Sintering
(**nonaq. electrolyte battery**
cathode active material capable of reversibly doping/undoping lithium)

IT Carbon black, uses
Carbonaceous materials (technological products)
(**nonaq. electrolyte battery**
cathode active material capable of reversibly doping/undoping lithium)

IT Fluoropolymers, uses
(**nonaq. electrolyte battery**
cathode active material capable of reversibly doping/undoping lithium)

IT Ball milling
(planetary; **nonaq. electrolyte battery cathode** active material capable of reversibly doping/undoping lithium)
IT 10028-23-6, Phosphoric acid, iron(2+) salt (2:3) octahydrate 10377-52-3, Lithium phosphate 14940-41-1, Iron phosphate fe3(po4)2 31096-55-6
(**nonaq. electrolyte battery cathode** active material capable of reversibly doping/undoping lithium)
IT 96-49-1, Ethylene carbonate 108-32-7, Propylene carbonate 616-38-6, Dimethyl carbonate 7439-93-2, Lithium, uses 7782-42-5, Graphite, uses 21324-40-3, Lithium hexafluorophosphate
(**nonaq. electrolyte battery cathode** active material capable of reversibly doping/undoping lithium)
IT 872-36-6, Vinylene carbonate 7440-44-0, Carbon, uses 9011-17-0, Hexafluoropropylene-vinylidene fluoride copolymer 24937-79-9, Poly(vinylidene fluoride)
(**nonaq. electrolyte battery cathode** active material capable of reversibly doping/undoping lithium)
IT 15365-14-7P, Iron lithium phosphate felipo4 **198782-39-7P**, Iron lithium phosphate (FeLi0-1(PO4))
(**nonaq. electrolyte battery cathode** active material capable of reversibly doping/undoping lithium)
IT 7782-44-7, Oxygen, uses
(**nonaq. electrolyte battery cathode** active material capable of reversibly doping/undoping lithium)

L55 ANSWER 8 OF 19 HCA COPYRIGHT 2002 ACS
136:281937 **Nonaqueous electrolyte battery** with **cathode** active material capable of reversibly doping/undoping lithium. Hosoya, Mamoru; Takahashi, Kimio; Fukushima, Yuzuru (Sony Corporation, Japan). Eur. Pat. Appl. EP 1193785 A2 20020403, 16 pp. DESIGNATED STATES: R: AT, BE, CH, DE, DK, ES, FR, GB, GR, IT, LI, LU, NL, SE, MC, PT, IE, SI, LT, LV, FI, RO. (English). CODEN: EPXXDW. APPLICATION: EP 2001-122769 20010921. PRIORITY: JP 2000-301402 20000929.
AB A LiFePO4 carbon composite material is to be synthesized in a single phase satisfactorily to prevent the deterioration of the performance of the **cathode** active material from occurring and achieve superior cell characteristics. In prepg. a **cathode** active material, starting materials for synthesis of a compd. represented by the general formula LixFePO4, where 0 < x .ltoreq. 1, are mixed, milled and a carbon material is added to the resulting mass at an optional time point in the course of mixing, milling and sintering. Li3PO4, Fe3(PO4)2 or its hydrates Fe3(PO4)2.cntdot.nH2O, where n denotes the no. of hydrates, are used as the starting materials for synthesis of LixFePO4. The temp. of a product from the sintering is

set to 305.degree. or less when the product from the sintering is exposed to atm.

IT **198782-39-7P**, Iron lithium phosphate (FeLi0-1(PO4))
(**nonaq. electrolyte battery** with **cathode** active material capable of reversibly doping/undoping lithium)

RN 198782-39-7 HCA

CN Iron lithium phosphate (FeLi0-1(PO4)) (9CI) (CA INDEX NAME)

Component	Ratio	Component Registry Number
O4P	1	14265-44-2
Li	0 - 1	7439-93-2
Fe	1	7439-89-6

IC ICM H01M004-58
ICS H01M010-40

CC **52-2** (Electrochemical, Radiational, and Thermal Energy Technology)

ST **battery cathode** lithium iron phosphate carbon composite

IT Secondary **batteries**
(lithium; **nonaq. electrolyte battery** with **cathode** active material capable of reversibly doping/undoping lithium)

IT **Battery cathodes**
Composites
(**nonaq. electrolyte battery** with **cathode** active material capable of reversibly doping/undoping lithium)

IT Carbonaceous materials (technological products)
(**nonaq. electrolyte battery** with **cathode** active material capable of reversibly doping/undoping lithium)

IT Fluoropolymers, uses
(**nonaq. electrolyte battery** with **cathode** active material capable of reversibly doping/undoping lithium)

IT Ball milling
(planetary; **nonaq. electrolyte battery** with **cathode** active material capable of reversibly doping/undoping lithium)

IT 10377-52-3, Lithium phosphate li3po4 14940-41-1, Iron phosphate fe3(po4)2 31096-55-6
(**nonaq. electrolyte battery** with **cathode** active material capable of reversibly doping/undoping lithium)

IT 96-49-1, Ethylene carbonate 108-32-7, Propylene carbonate 616-38-6, Dimethyl carbonate 872-36-6, Vinylene carbonate 7439-93-2, Lithium, uses 7782-42-5, Graphite, uses 9011-17-0, Hexafluoropropylene-vinylidene fluoride copolymer 21324-40-3,

Lithium hexafluorophosphate
(**nonaq. electrolyte battery** with **cathode** active material capable of reversibly doping/undoping lithium)

IT 7440-44-0, Carbon, uses 24937-79-9, Pvdf
(**nonaq. electrolyte battery** with **cathode** active material capable of reversibly doping/undoping lithium)

IT 15365-14-7P, Iron lithium phosphate FeLiPO4 **198782-39-7P**, Iron lithium phosphate (FeLi0-1(PO4))
(**nonaq. electrolyte battery** with **cathode** active material capable of reversibly doping/undoping lithium)

L55 ANSWER 9 OF 19 HCA COPYRIGHT 2002 ACS

136:265826 Method for the preparation of **cathode** active material for a **nonaqueous electrolyte battery**. Hosoya, Mamoru; Takahashi, Kimio; Fukushima, Yuzuru (Sony Corporation, Japan). Eur. Pat. Appl. EP 1193784 A2 20020403, 16 pp. DESIGNATED STATES: R: AT, BE, CH, DE, DK, ES, FR, GB, GR, IT, LI, LU, NL, SE, MC, PT, IE, SI, LT, LV, FI, RO. (English). CODEN: EPXXDW. APPLICATION: EP 2001-122752 20010921. PRIORITY: JP 2000-301403 20000929.

AB A LiFePO4 carbon composite material is to be synthesized in a single phase satisfactorily to achieve superior cell characteristics. In prepg. a **cathode** active material, a starting material for synthesis of a compd. represented by the general formula LixFePO4, where 0<.times..ltoreq.1, is mixed, milled and sintered and a carbon material is added to the resulting mass at an optional time point in the course of mixing, milling and sintering. Li3PO4, Fe3(PO4)2 or its hydrates Fe3(PO4)2.cntdot.nH2O, where n denotes the no. of hydrates, are used as the starting material for synthesis of LixFePO4. The particle size distribution of particles of the starting material for synthesis following the milling with the particle size not less than 3 .mu.m is set to 2.2% or less in terms of the volumetric integration frequency.

IT **198782-39-7P**, Iron lithium phosphate (FeLi0-1(PO4))
(method for prepn. of **cathode** active material for **nonaq. electrolyte battery**)

RN 198782-39-7 HCA

CN Iron lithium phosphate (FeLi0-1(PO4)) (9CI) (CA INDEX NAME)

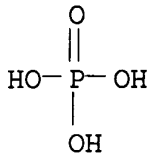
Component	Ratio	Component Registry Number
O4P	1	14265-44-2
Li	0 - 1	7439-93-2
Fe	1	7439-89-6

IC ICM H01M004-58
ICS H01M010-40

CC **52-2** (Electrochemical, Radiational, and Thermal Energy

Technology)
ST **battery cathode** lithium iron phosphate carbon composite
IT Secondary **batteries**
(lithium; method for prepn. of **cathode** active material for **nonaq. electrolyte battery**)
IT **Battery cathodes**
Particle size distribution
(method for prepn. of **cathode** active material for **nonaq. electrolyte battery**)
IT Carbon black, uses
(method for prepn. of **cathode** active material for **nonaq. electrolyte battery**)
IT Ball milling
(planetary; method for prepn. of **cathode** active material for **nonaq. electrolyte battery**)
IT 108-32-7, Propylene carbonate 616-38-6, Dimethyl carbonate 9011-17-0, Hexafluoropropylene-vinylidene fluoride copolymer 21324-40-3, Lithium hexafluorophosphate
(method for prepn. of **cathode** active material for **nonaq. electrolyte battery**)
IT 7440-44-0, Carbon, uses
(method for prepn. of **cathode** active material for **nonaq. electrolyte battery**)
IT 15365-14-7P, Iron lithium phosphate FeLiPO4 **198782-39-7P**, Iron lithium phosphate (FeLi0-1(PO4))
(method for prepn. of **cathode** active material for **nonaq. electrolyte battery**)

L55 ANSWER 10 OF 19 HCA COPYRIGHT 2002 ACS
134:334625 Lithium ion **conduction** in LiTi2(PO4)3. Takada, K.; Tansho, M.; Yanase, I.; Inada, T.; Kajiyama, A.; Kouguchi, M.; Kondo, S.; Watanabe, M. (National Institute for Research in Inorganic Materials, Tsukuba, Ibaraki, 305-0044, Japan). Solid State Ionics, 139(3,4), 241-247 (English) 2001. CODEN: SSIOD3. ISSN: 0167-2738. Publisher: Elsevier Science B.V..
AB Li+ ion **conduction** was examd. for a mixt. of LiTi2(PO4)3 (LTP) and a glassy **electrolyte**, 0.01Li3PO4-0.63Li2S-0.36SiS2. The addn. of LTP with 10 wt. % Resulted in a significant decrease in activation energy for **conduction** and little influence on the Li+ ion **cond**., although it **reduced** the **conduction** path in the glass. The 7Li NMR spectra of LTP was quite similar to that of Li1.3Al0.3Ti1.7(PO4)3 (LATP) with a high **cond**. of 10-3 S cm-1. These results suggest that Li+ ion **conduction** in LTP is as high as that in the glassy **electrolyte** and LATP.
IT **30622-39-0**, Lithium titanium phosphate (LiTi2(PO4)3)
(lithium ion **conduction** in LiTi2(PO4)3)
RN 30622-39-0 HCA
CN Phosphoric acid, lithium titanium(4+) salt (3:1:2) (8CI, 9CI) (CA INDEX NAME)



●1/3 Li

●2/3 Ti(IV)

CC 76-1 (Electric Phenomena)
ST lithium ion **conduction** lithium titanium phosphate
IT Ionic **conductivity**
NMR (nuclear magnetic resonance)
(lithium ion **conduction** in LiTi2(PO4)3)
IT 10377-52-3, Lithium phosphate (Li3PO4) 12136-58-2, Lithium sulfide (Li2S) 13759-10-9, Silicon sulfide (SiS2) 17341-24-1, Lithium(1+), properties **30622-39-0**, Lithium titanium phosphate (LiTi2(PO4)3)
(lithium ion **conduction** in LiTi2(PO4)3)

L55 ANSWER 11 OF 19 HCA COPYRIGHT 2002 ACS
134:210598 Preparation of lithium-containing phosphates for **battery** use. Barker, Jeremy; Saidi, M. Yazid (Valence Technology, Inc., USA). U.S. US 6203946 B1 20010320, 13 pp. (English). CODEN: USXXAM. APPLICATION: US 1998-204944 19981203.
AB The invention provides an **electrochem. cell** which comprises a first electrode and a second electrode which is a counter electrode to the first electrode. The first electrode comprises a phosphorous compd. of the nominal general formula Li3E'aE"b(PO4)3, desirably at least one E is a metal; and preferably, Li3M'M"(PO4)3. E' and E" are the same or different from one another. Where E' and E" are the same, they are preferably metals having more than one oxidn. state. Where E' and E" are different from one another, they are preferably selected from the group of metals where at least one of E' and E" has more than one oxidn. state.
IT **329025-35-6P**, Iron lithium phosphate (Fe2Li1-3(PO4)3)
(prepn. of lithium-contg. phosphates for **battery** use)
RN 329025-35-6 HCA
CN Iron lithium phosphate (Fe2Li1-3(PO4)3) (9CI) (CA INDEX NAME)

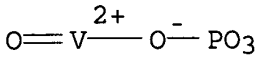
Component	Ratio	Component Registry Number

O4P	3	14265-44-2
Li	1 - 3	7439-93-2
Fe	2	7439-89-6

IC ICM H01M004-58
ICS H01M004-48
NCL 429231100
CC **52-2** (Electrochemical, Radiational, and Thermal Energy Technology)
ST **battery** electrode lithium contg phosphate
IT Secondary **batteries**
(lithium; prepn. of lithium-contg. phosphates for **battery** use)
IT **Battery cathodes**
(prepn. of lithium-contg. phosphates for **battery** use)
IT 96-49-1, Ethylene carbonate 616-38-6, Dimethyl carbonate
(prepn. of lithium-contg. phosphates for **battery** use)
IT 36058-25-0P, Iron lithium phosphate Fe2Li3(PO4)3 69104-85-4P, Chromium lithium phosphate Cr2Li3(PO4)3 204653-30-5P, Lithium vanadium phosphate Li3V2(PO4)3 285564-74-1P **329025-35-6P**, Iron lithium phosphate (Fe2Li1-3(PO4)3) 329025-36-7P 329025-38-9P 329025-39-0P
(prepn. of lithium-contg. phosphates for **battery** use)
IT 554-13-2, Lithium carbonate 1310-65-2, Lithium hydroxide 1314-62-1, Vanadium pentoxide, reactions 7783-28-0, Diammonium hydrogen phosphate 7790-69-4, Lithium nitrate
(prepn. of lithium-contg. phosphates for **battery** use)

L55 ANSWER 12 OF 19 HCA COPYRIGHT 2002 ACS
133:337629 Highly reversible Li insertion at 4 V in .epsilon.-VOPO4/.alpha.-LiVOPO4 **cathodes**. Kerr, T. A.; Gaubicher, J.; Nazar, L. F. (Department of Chemistry, University of Waterloo, Waterloo, ON, N2L 3G1, Can.). Electrochemical and Solid-State Letters, 3(10), 460-462 (English) 2000. CODEN: ESLEF6. ISSN: 1099-0062. Publisher: Electrochemical Society.
AB Electrochem. (and chem.) lithium intercalation into a new vanadium phosphate, .epsilon.-VOPO4, is a two-phase process involving **redn**. of VV to VIV at an attractive potential (3.95V). X-ray diffraction shows that this material and that obtained from LiI **redn**. are structurally similar to high-temp. .alpha.-LiVOPO4. Increased stability and capacity are achieved with chem. lithiated .epsilon.-VOPO4 when contact with the **conductive** additive is enhanced by mech. grinding. Following the first charge cycle, reversible electrochem. lithium extn./insertion at a cycling rate of C/10 affords a specific capacity of over 100 mAh/g (3.0-4.5 V window) that is stable for at least 100 cycles. This material demonstrates the best overall properties, thus far. of any polyanionic vanadium phosphate structure.
IT **83348-01-0**
(highly reversible Li insertion in .epsilon.-VOPO4/.alpha.-

LiVOPO4 **cathodes**)
RN 83348-01-0 HCA
CN Vanadate(1-), oxo[phosphato(3-)-.kappa.O]-, lithium (9CI) (CA INDEX NAME)



CC **52-2** (Electrochemical, Radiational, and Thermal Energy Technology)
Section cross-reference(s): **72**
ST lithium intercalation vanadium phosphate **cathode battery**
IT **Battery cathodes**
Crystal structure
Intercalation
(highly reversible Li insertion in .epsilon.-VOPO4/.alpha.-LiVOPO4 **cathodes**)
IT Secondary **batteries**
(lithium; highly reversible Li insertion in .epsilon.-VOPO4/.alpha.-LiVOPO4 **cathodes**)
IT 10377-51-2, Lithium iodide (LiI) 12359-27-2 **83348-01-0**
(highly reversible Li insertion in .epsilon.-VOPO4/.alpha.-LiVOPO4 **cathodes**)

L55 ANSWER 13 OF 19 HCA COPYRIGHT 2002 ACS
133:298811 Method for manufacturing active material of positive plate for **nonaqueous electrolyte secondary cell**. Li, Guohua; Yamada, Atsuo (Sony Corporation, Japan). PCT Int. Appl. WO 2000060679 A1 20001012, 88 pp. DESIGNATED STATES: W: CA, CN, JP, KR, US; RW: AT, BE, CH, CY, DE, DK, ES, FI, FR, GB, GR, IE, IT, LU, MC, NL, PT, SE. (Japanese). CODEN: PIXXD2. APPLICATION: WO 2000-JP1915 20000328. PRIORITY: JP 1999-99407 19990406; JP 1999-274746 19990928; JP 1999-274747 19990928.
AB A method for manufg. an active material of a pos. plate which is doped/dedoped well reversely with/of lithium comprises mixing materials including a **reducing** agent to be used as a synthetic material of a compd. whose compn. is expressed by a general formula LixMyPO4 (where 0<x.ltoreq.2, 0.8.ltoreq.y.ltoreq.1.2, and M is at least one element selected from 3d-transition metals) to produce a precursor and firing the precursor..
IT **213467-46-0P**, Iron lithium manganese phosphate (FeLi2Mn(PO4)2)
(manuf. of active material of pos. plate for **nonaq. electrolyt secondary cell**)

RN 213467-46-0 HCA
CN Iron lithium manganese phosphate (FeLi2Mn(PO4)2) (9CI) (CA INDEX NAME)

Component	Ratio	Component Registry Number
O4P	2	14265-44-2
Mn	1	7439-96-5
Li	2	7439-93-2
Fe	1	7439-89-6

IC ICM H01M004-58
ICS H01M010-40; H01M004-04
CC **52-2** (Electrochemical, Radiational, and Thermal Energy Technology)
ST **pos electrode** lithium dopant **secondary cell**; **secondary cell nonaq electrolyte pos electrode**
IT Secondary **batteries**
(**nonaq. electrolyte**; method for manufg. active material of pos. plate for **nonaq. electrolyte secondary cell**)
IT **Battery electrodes**
(**pos.**; method for manufg. active material of pos. plate for **nonaq. electrolyte secondary cell**)
IT 554-13-2, Lithium carbonate 3094-87-9, Ferrous acetate 6047-25-2, Ferrous oxalate dihydrate 6156-78-1, Manganese acetate tetrahydrate 7722-76-1, Ammonium dihydrogen phosphate
(in manuf. of active material of pos. plate for **nonaq. electrolyte secondary cell**)
IT 13826-59-0P, Lithium manganese phosphate **213467-46-0P**, Iron lithium manganese phosphate (FeLi2Mn(PO4)2)
(manuf. of active material of pos. plate for **nonaq. electrolyte secondary cell**)
IT 13816-45-0P, Triphylite (FeLi(PO4))
(method for manufg. active material of pos. plate for **nonaq. electrolyte secondary cell**)

L55 ANSWER 14 OF 19 HCA COPYRIGHT 2002 ACS
132:38039 Supercapacitors and **batteries**. Goodenough, J. B.; Lee, Hee Y.; Manivannan, V. (Texas Materials Institute, ETC 9.102, University of Texas at Austin, Austin, TX, 78712-1063, USA). Materials Research Society Symposium Proceedings, 548(Solid State Ionics V), 655-665 (English) 1999. CODEN: MRSPDH. ISSN: 0272-9172. Publisher: Materials Research Society.
AB Comparisons are made between the material requirements for supercapacitor electrodes and the **cathode** of a lithium-ion **battery**. The performances of the **battery cathodes** Li1+xFe2(SO4)2(PO4) and Li1+xVMoO6 are compared to

those for supercapacitor electrodes operating with 5.3M H2SO4, Nafion 117, or 2M KCl aq. soln. at pH 6.7. The use of a KCl aq. **electrolyte** at mild pH allows stabilization of amorphous, hydrated electrode materials such as a-MnO2.nH2O that are not stable in 5.3M H2SO4 or with Nafion 117. However, the larger K+ ion appears to **reduce** by a factor of three the theor. capacity attainable with H+ ions.

IT **205380-60-5D**, Iron lithium phosphate sulfate (Fe2LiPO4(SO4)2), lithium-intercalated
(materials for supercapacitor electrodes and lithium **battery cathodes**)

RN 205380-60-5 HCA

CN Iron lithium phosphate sulfate (Fe2Li(PO4)(SO4)2) (9CI) (CA INDEX NAME)

Component	Ratio	Component Registry Number
O4S	2	14808-79-8
O4P	1	14265-44-2
Li	1	7439-93-2
Fe	2	7439-89-6

CC **52-2** (Electrochemical, Radiational, and Thermal Energy Technology)

ST supercapacitor electrode lithium **battery cathode**

IT Capacitors
(double layer; materials for supercapacitor electrodes and lithium **battery cathodes**)

IT Secondary **batteries**
(lithium; materials for supercapacitor electrodes and lithium **battery cathodes**)

IT **Battery cathodes**
Electrodes
(materials for supercapacitor electrodes and lithium **battery cathodes**)

IT 12169-23-2, Thorium titanium oxide (ThTi2O6) 12299-92-2D, Lithium molybdenum vanadium oxide (LiMoVO6), lithium-intercalated 26088-58-4, Manganese dioxide hydrate 32740-79-7, Ruthenium dioxide hydrate 36058-25-0D, Iron lithium phosphate (Fe2Li3(PO4)3), lithium-intercalated 51312-22-2, Manganese potassium oxide hydrate 174015-34-0D, Iron lithium sulfate (Fe2Li(SO4)3), lithium-intercalated **205380-60-5D**, Iron lithium phosphate sulfate (Fe2LiPO4(SO4)2), lithium-intercalated
(materials for supercapacitor electrodes and lithium **battery cathodes**)

IT 7447-40-7, Potassium chloride, uses 7664-93-9, Sulfuric acid, uses 66796-30-3, Nafion 117
(materials for supercapacitor electrodes and lithium **battery cathodes**)

L55 ANSWER 15 OF 19 HCA COPYRIGHT 2002 ACS

130:156101 Secondary lithium **batteries** inhibiting lithium dendrite generation and electronic apparatus using the **batteries**. Ikgawa, Akiko; Tsuruoka, Shigeo; Takeuchi, Seiji; Yoshikawa, Masanori; Muranaka, Kiyoshi (Hitachi, Ltd., Japan). Jpn. Kokai Tokkyo Koho JP 11016571 A2 19990122 Heisei, 9 pp. (Japanese). CODEN: JKXXAF. APPLICATION: JP 1997-165588 19970623.

AB The **batteries** use mixed oxides AwNvNixMyO2 (A = alkali metal; N = Mg, P; M = Mn, Co, Al; w = 0.05-1.2; v = 0.0001-0.02; x = 0.6-0.95; y = 0.005-0.4) as **cathode** active mass and carbon materials as anode active mass, whereas the carbon materials contain elements capable of forming compds. with alkali metals and contain another elements which do not form compds. with the alkali metals. The reactive elements may be selected from Pb, Sn, Al, Si, In, Ga, Ag, B, and Mg, and the inert elements may be selected from Fe, Cu, Co, Ni, P, S, and Se. Elec. app. equipped with the **batteries** are claimed. The elec. app. involve note-sized or pocket-sized personal computers and word processors, elec. book players, pen-input personal computers, (portable) telephones and copying machines, pagers, electronic diaries, calculators, liq. crystal televisions, electronic tools, translators, transceivers, memory cards, back-up power sources, tape recorders, radios, headphone stereophonic recorders, portable printers, handy cleaners, portable CD, video cassette recorders, road map-navigation systems, refrigerators, air conditioners, televisions, water-heating appliances, electronic ovens, dish washers, laundry machines, drying machines, game machines, lighting fitting, toys, road conditioners, medical equipments, (elec.) automobiles, elec. power-storage systems,. The reactive elements react with alkali metals (i.e., Li) to prevent generation of alkali metal dendrite in overcharging, while the formed compds. discharge the alkali metals in overdischarging to prevent **redn**. of the **electrolytes**.

IT **220179-38-4**, Cobalt lithium nickel oxide phosphate (Co0.3Li0.05-1.2Ni0.7O1.96(PO4)0.01) **220179-44-2** **220179-46-4**, Lithium manganese nickel oxide phosphate (Li0.05-1.2Mn0.3Ni0.7O1.96(PO4)0.01) **220179-48-6** **220179-52-2**, Aluminum lithium nickel oxide phosphate (Al0.3Li0.05-1.2Ni0.7O1.96(PO4)0.01) **220179-54-4**
(**cathodes**; secondary Li **batteries** using carbon anodes and alkali metal nickel oxide **cathodes**)

RN 220179-38-4 HCA

CN Cobalt lithium nickel oxide phosphate (Co0.3Li0.05-1.2Ni0.7O1.96(PO4)0.01) (9CI) (CA INDEX NAME)

Component	Ratio	Component Registry Number
O	1.96	17778-80-2
O4P	0.01	14265-44-2
Co	0.3	7440-48-4
Ni	0.7	7440-02-0

Li	0.05 - 1.2	7439-93-2

RN 220179-44-2 HCA
CN Cobalt lithium magnesium nickel oxide phosphate (Co0.1Li0.05-1.2Mg0.01Ni0.9O1.96(PO4)0.01) (9CI) (CA INDEX NAME)

Component	Ratio	Component Registry Number
O	1.96	17778-80-2
O4P	0.01	14265-44-2
Co	0.1	7440-48-4
Ni	0.9	7440-02-0
Mg	0.01	7439-95-4
Li	0.05 - 1.2	7439-93-2

RN 220179-46-4 HCA
CN Lithium manganese nickel oxide phosphate (Li0.05-1.2Mn0.3Ni0.7O1.96(PO4)0.01) (9CI) (CA INDEX NAME)

Component	Ratio	Component Registry Number
O	1.96	17778-80-2
O4P	0.01	14265-44-2
Ni	0.7	7440-02-0
Mn	0.3	7439-96-5
Li	0.05 - 1.2	7439-93-2

RN 220179-48-6 HCA
CN Lithium magnesium manganese nickel oxide phosphate (Li0.05-1.2Mg0.01Mn0.2Ni0.8O1.96(PO4)0.01) (9CI) (CA INDEX NAME)

Component	Ratio	Component Registry Number
O	1.96	17778-80-2
O4P	0.01	14265-44-2
Ni	0.8	7440-02-0
Mn	0.2	7439-96-5
Mg	0.01	7439-95-4
Li	0.05 - 1.2	7439-93-2

RN 220179-52-2 HCA
CN Aluminum lithium nickel oxide phosphate (Al0.3Li0.05-1.2Ni0.7O1.96(PO4)0.01) (9CI) (CA INDEX NAME)

Component	Ratio	Component Registry Number
O	1.96	17778-80-2
O4P	0.01	14265-44-2

Ni	0.7	7440-02-0
Li	0.05 - 1.2	7439-93-2
Al	0.3	7429-90-5

RN 220179-54-4 HCA
CN Aluminum lithium magnesium nickel oxide phosphate (Al0.2Li0.05-1.2Mg0.01Ni0.8O1.96(PO4)0.01) (9CI) (CA INDEX NAME)

Component	Ratio	Component Registry Number
O	1.96	17778-80-2
O4P	0.01	14265-44-2
Ni	0.8	7440-02-0
Mg	0.01	7439-95-4
Li	0.05 - 1.2	7439-93-2
Al	0.2	7429-90-5

IC ICM H01M004-58
ICS H01M004-02; H01M010-40
CC **52-2** (Electrochemical, Radiational, and Thermal Energy Technology)
ST lithium **battery** carbon anode additive; alkali metal nickel oxide **battery cathode**; dendrite prevention lithium **battery** anode
IT **Battery** anodes
Battery cathodes
(secondary Li **batteries** using carbon anodes and alkali metal nickel oxide **cathodes**)
IT 1344-28-1, Alumina, uses 7429-90-5, Aluminum, uses 7439-89-6, Iron, uses 7439-92-1, Lead, uses 7439-95-4, Magnesium, uses 7440-02-0, Nickel, uses 7440-21-3, Silicon, uses 7440-22-4, Silver, uses 7440-31-5, Tin, uses 7440-42-8, Boron, uses 7440-48-4, Cobalt, uses 7440-50-8, Copper, uses 7440-55-3, Gallium, uses 7440-74-6, Indium, uses 7704-34-9, Sulfur, uses 7720-78-7, Iron sulfate (FeSO4) 7723-14-0, Phosphorus, uses 7782-49-2, Selenium, uses 10045-86-0, Iron phosphate (FePO4) 12035-57-3, Nickel silicide (NiSi) 12054-11-4 12059-14-2, Nickel silicide (Ni2Si) 21651-19-4, Tin oxide (SnO) 22831-39-6, Magnesium silicide (Mg2Si) 220179-34-0, Tin oxide silicide (SnO2Si) 220179-35-1, Aluminum tin oxide (AlSnO2) 220179-36-2, Tin boride oxide (SnBO2)
(additive in carbon anodes; secondary Li **batteries** using carbon anodes and alkali metal nickel oxide **cathodes**)
IT 7440-44-0, Carbon, uses
(**battery** anodes; secondary Li **batteries** using carbon anodes and alkali metal nickel oxide **cathodes**)
IT 220179-37-3, Cobalt lithium magnesium nickel oxide (Co0.3Li0.05-1.2Mg0.01Ni0.7O2) **220179-38-4**, Cobalt lithium nickel oxide phosphate (Co0.3Li0.05-1.2Ni0.7O1.96(PO4)0.01) 220179-39-5, Cobalt lithium magnesium nickel oxide

(Co0.2Li0.05-1.2Mg0.01Ni0.8O2) 220179-40-8, Cobalt lithium magnesium nickel oxide (Co0.1Li0.05-1.2Mg0.01Ni0.9O2) 220179-41-9, Cobalt lithium magnesium nickel oxide (Co0.1Li0.05-1.2Mg0.02Ni0.9O2) 220179-42-0, Cobalt lithium nickel oxide (Co0.1Li0.05-1.2Ni0.9O2) **220179-44-2** 220179-45-3, Lithium magnesium manganese nickel oxide (Li0.05-1.2Mg0.01Mn0.3Ni0.7O2) **220179-46-4**, Lithium manganese nickel oxide phosphate (Li0.05-1.2Mn0.3Ni0.7O1.96(PO4)0.01) 220179-47-5, Lithium magnesium manganese nickel oxide (Li0.05-1.2Mg0.01Mn0.2Ni0.8O2) **220179-48-6** 220179-49-7, Lithium magnesium manganese nickel oxide (Li0.05-1.2Mg0.01Mn0.1Ni0.9O2) 220179-50-0, Lithium manganese nickel oxide (Li0.05-1.2Mn0.1Ni0.9O2) 220179-51-1, Aluminum lithium magnesium nickel oxide (Al0.3Li0.05-1.2Mg0.01Ni0.7O2) **220179-52-2**, Aluminum lithium nickel oxide phosphate (Al0.3Li0.05-1.2Ni0.7O1.96(PO4)0.01) 220179-53-3, Aluminum lithium magnesium nickel oxide (Al0.2Li0.05-1.2Mg0.01Ni0.8O2) **220179-54-4** 220179-55-5, Aluminum lithium magnesium nickel oxide (Al0.1Li0.05-1.2Mg0.01Ni0.9O2) 220179-56-6, Aluminum lithium nickel oxide (Al0.1Li0.05-1.2Ni0.9O2)
(**cathodes**; secondary Li **batteries** using carbon anodes and alkali metal nickel oxide **cathodes**)

L55 ANSWER 16 OF 19 HCA COPYRIGHT 2002 ACS
129:325267 Effects of Counterions in Heteropoly **Electrolyte** Chemistry. 1. Evaluations of Relative Interactions by NMR on Kozik Salts. Kirby, James F.; Baker, Louis C. W. (Department of Chemistry, Georgetown University, Washington, DC, 20057, USA). Inorganic Chemistry, 37(21), 5537-5543 (English) 1998. CODEN: INOCAJ. ISSN: 0020-1669. Publisher: American Chemical Society.
AB Evidence is accumulating for the major influence of the identities of counterions on syntheses and properties of various heteropoly anions. An easy and convenient NMR method is presented for evaluating the extent of significant assocn. between heteropoly tungstate species and monoat. metallic counterions (e.g., alkali metal cations). In diamagnetic [.alpha.2-P2W17O61-Th4+-.alpha.2-O61W17P2]16-, the Th linkage is a flexible **conducting** bridge between the two substituted Wells-Dawson entities. A Kozik complex is a heteropoly species contg. added delocalized blue electrons exchanging rapidly among several atoms (the belt W atoms of one Wells-Dawson unit in this case) while the same electrons exchange at a much slower rate through a **conducting** bridge. If a soln. of the parent oxidized complex is **reduced** by 2 electrons per anion, the added electron pairs are distributed among the Wells-Dawson entities present, yielding an equil. mixt. of oxidized, 4-electron-**reduced**, and 2-electron-**reduced** complexes. The 31P NMR spectrum of this mixt. consists, for each of the two structural types of P atoms, of three lines: one for each kind of complex. The signal for the 2-electron-**reduced** species, which contains a pair of electrons in one heteropoly entity and none in the other, is a coalesced exchange peak located between the other two signals. These Th complexes have anti and syn conformations. When large

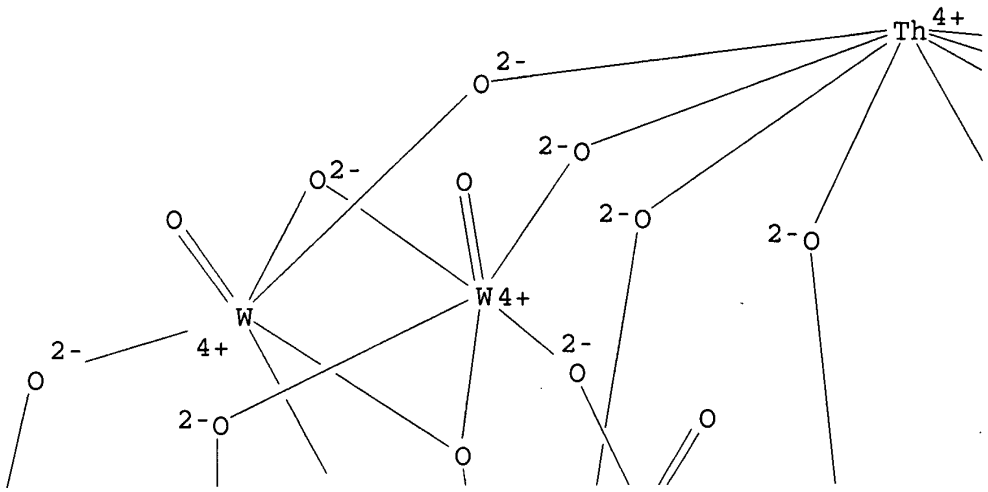
firmly hydrated Li+ is the only counterion, the complex remains in the anti conformation and the exchange peak is always exactly midway between the peaks for the oxidized and 4-electron-**reduced** species. When even small amts. of other alkali metal cations are present, they coordinate in a pocket between the heteropoly lobes of the Th complex, holding it in the syn conformation. In the syn conformation, the P atoms in one heteropoly lobe can sense whether or not the other lobe contains added electrons. This is manifested by the exchange peak moving off-center between the signals from the oxidized and 4-electron-**reduced** species. The more concd. the non-Li counterion, the greater the displacement of the coalesced signal. The order of effectiveness in the displacement is Rb > K > Na. These observations are explained, as are small changes in chem. shifts for all the species when K(H2O)m+ progressively displaces Li(H2O)n+ attached to the surface of the heteropoly entities. Probably electron exchange through the Th and the K coordinated in the pocket adds to the stability of the syn-K Kozik complex.

IT **214786-29-5P**
(prepn., **redn**. and substitution of lithium by alkali metal ions in Kozik salts as studied by NMR spectroscopy)

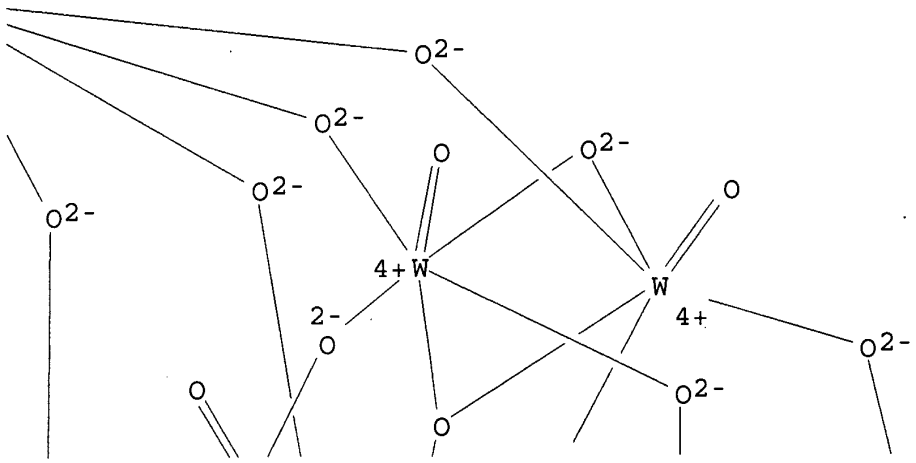
RN 214786-29-5 HCA

CN Thorate(16-), bis[dotriaconta-.mu.-oxoheptadecaoxo[.mu.8-[phosphato(3-)-.kappa.O:.kappa.O:.kappa.O':.kappa.O':.kappa.O'':.kappa.O'':.kappa.O'':.kappa.O''']][.mu.9-[phosphato(3-)-.kappa.O:.kappa.O:.kappa.O:.kappa.O':.kappa.O':.kappa.O'':.kappa.O'':.kappa.O''':.kappa.O''']]heptadecatungstate]octa-.mu.-oxo-, hexadecalithium (9CI) (CA INDEX NAME)

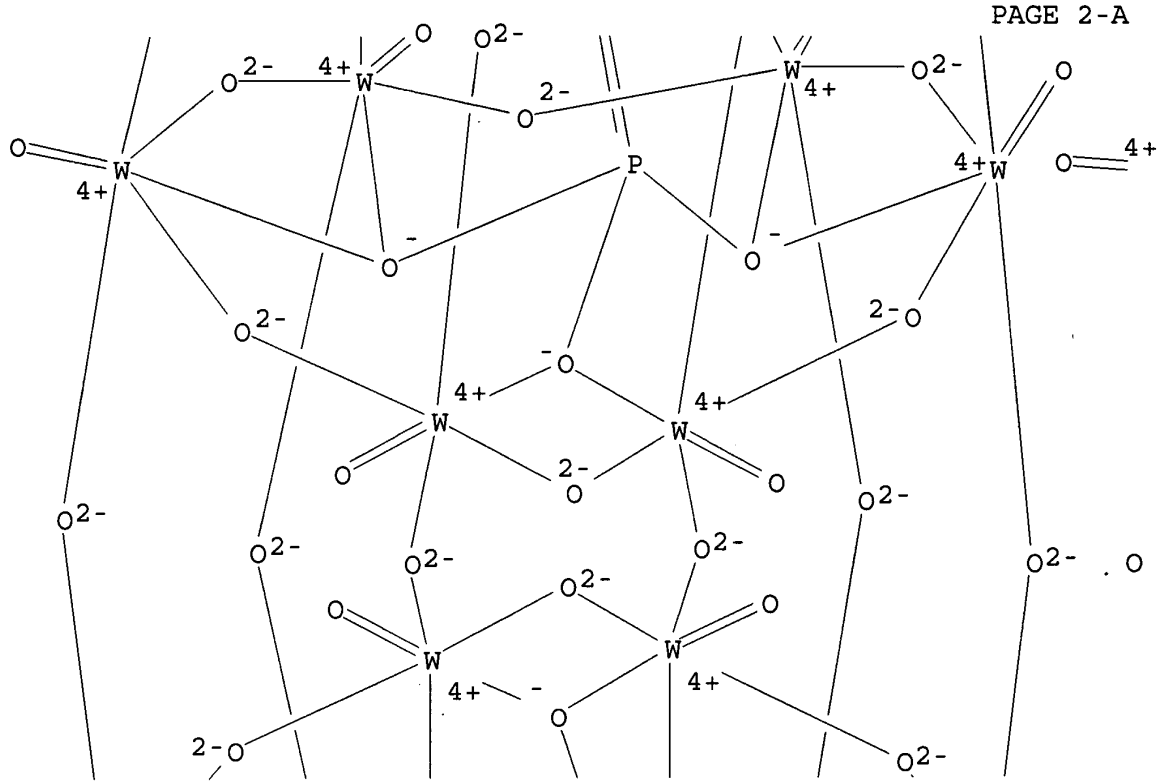
PAGE 1-A



PAGE 1-B



PAGE 2-A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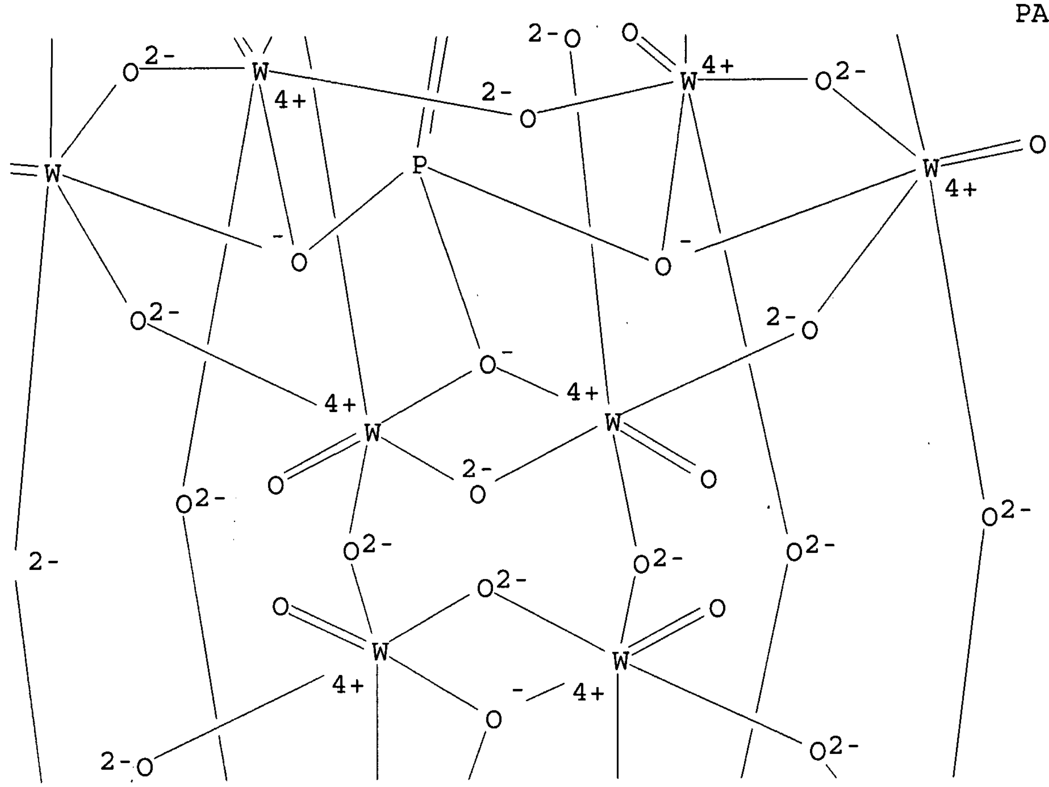
PAGE 2-B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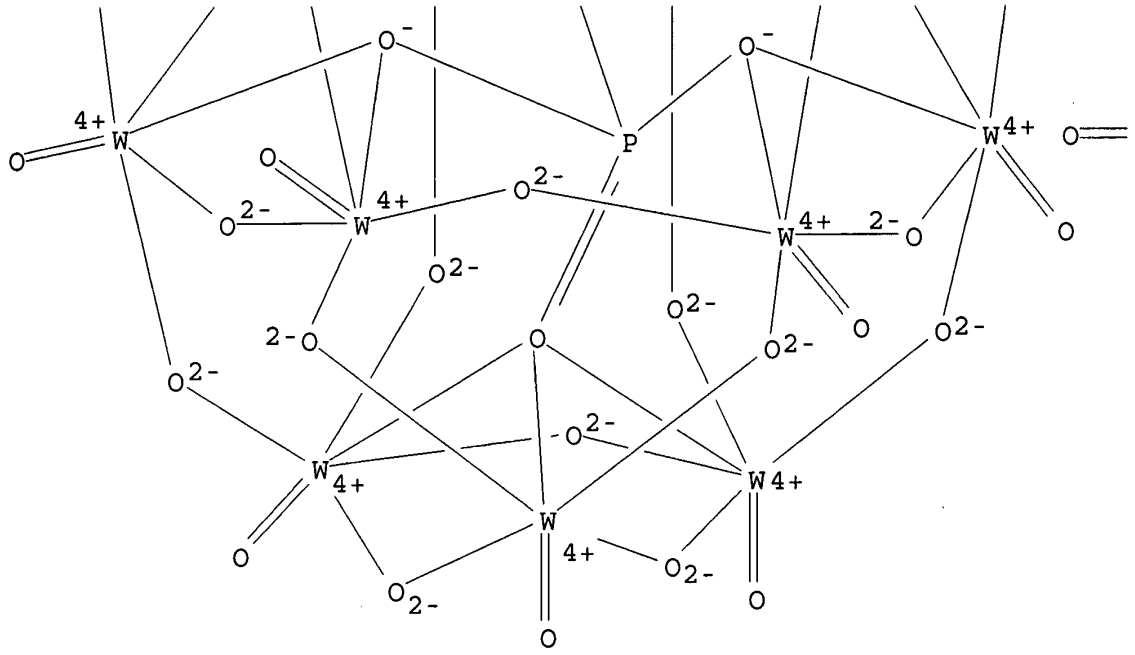
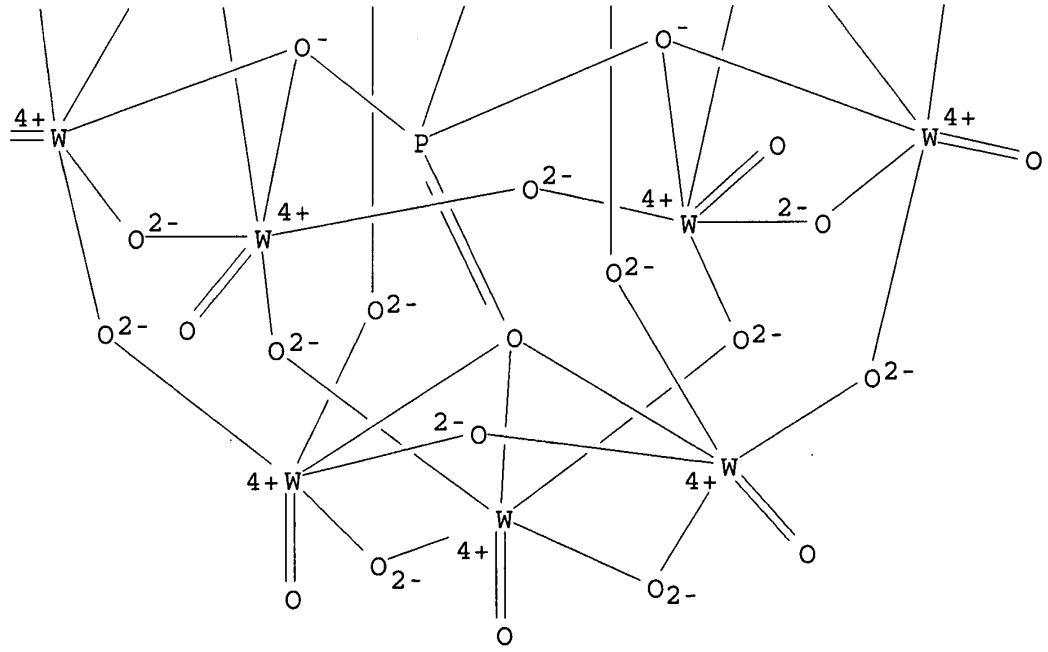
PAGE 3-A



PAGE 3-B



CC 78-7 (Inorganic Chemicals and Reactions)
Section cross-reference(s): **72**, 77
IT **Reduction**, electrochemical
(for prepn. of Kozik salts)
IT Heteropoly acids
(tungstothorophosphates; prepn., **redn.** and substitution of lithium by alkali metal ions in Kozik salts as studied by NMR spectroscopy)
IT **214786-29-5P**
(prepn., **redn.** and substitution of lithium by alkali metal ions in Kozik salts as studied by NMR spectroscopy)

L55 ANSWER 17 OF 19 HCA COPYRIGHT 2002 ACS
128:5716 **Cathode** materials for secondary alkali metal-ion and lithium-ion **batteries**. Goodenough, John B.; Padhi, Akshaya; Nanjundaswamy, K. S.; Masquelier, Christian (Board of Regents, the University of Texas System, USA). PCT Int. Appl. WO 9740541 A1 19971030, 47 pp. DESIGNATED STATES: W: CA, JP; RW: AT, BE, CH, DE, DK, ES, FI, FR, GB, GR, IE, IT, LU, MC, NL, PT, SE. (English). CODEN: PIXXD2. APPLICATION: WO 1997-US6671 19970423. PRIORITY: US 1996-16060 19960423; US 1996-32346 19961204.
AB The **cathode** materials are LiMPO4, where M is .gtoreq.1 1st-row transition-metal cation; Mn, Fe, Co, and/or Ni; or Fe1-xMnx or Fe1-xTix, where 0 <x <1. The **cathode** materials comprise a rhombohedral Nasicon material M1xM2(PO4)3, where M1 is Li or Na and x .ltoreq.5.
IT **198782-39-7**, Iron lithium phosphate (FeLi0-1(PO4))
198782-41-1, Iron lithium phosphate (Fe2Li3-5(PO4)3)
(**cathode** materials for secondary lithium-ion **batteries**)
RN 198782-39-7 HCA
CN Iron lithium phosphate (FeLi0-1(PO4)) (9CI) (CA INDEX NAME)

Component	Ratio	Component Registry Number
O4P	1	14265-44-2
Li	0 - 1	7439-93-2
Fe	1	7439-89-6

RN 198782-41-1 HCA
CN Iron lithium phosphate (Fe2Li3-5(PO4)3) (9CI) (CA INDEX NAME)

Component	Ratio	Component Registry Number
O4P	3	14265-44-2
Li	3 - 5	7439-93-2
Fe	2	7439-89-6

IC ICM H01M004-58

ICS C01B025-26
CC **52-2** (Electrochemical, Radiational, and Thermal Energy Technology)
Section cross-reference(s): 49
ST **cathode** material alkali metal ion **battery**; lithium ion **battery cathode** material; transition metal lithium phosphate **battery cathode**; Nasicon material alkali metal ion **battery**
IT **Battery cathodes**
(materials for secondary alkali metal-ion and lithium-ion)
IT 36058-25-0P, Iron lithium phosphate (Fe2Li3(PO4)3) 184241-62-1P 196612-05-2P, Iron lithium niobium phosphate (FeLiNb(PO4)3) 198782-43-3P, Lithium vanadium phosphate (LiV2(PO4)3)
(**cathode** materials for secondary lithium-ion **batteries**)
IT 15365-14-7, Iron lithium phosphate (LiFePO4) 196612-01-8, Lithium sodium vanadium phosphate (Li2NaV2(PO4)3) **198782-39-7**, Iron lithium phosphate (FeLi0-1(PO4)) **198782-41-1**, Iron lithium phosphate (Fe2Li3-5(PO4)3) 198782-42-2, Iron lithium phosphate sulfate (Fe2Li1-3(PO4)(SO4)2)
(**cathode** materials for secondary lithium-ion **batteries**)
IT 11123-44-7 59205-70-8 198782-44-4, Lithium niobium titanium phosphate (Li0-2NbTi(PO4)3) 198782-45-5, Iron lithium niobium phosphate (FeLi1-3Nb(PO4)3)
(**cathode** materials for secondary lithium-ion **batteries**)

L55 ANSWER 18 OF 19 HCA COPYRIGHT 2002 ACS
127:97562 **Cathode** active mass for lithium secondary **batteries** and the **batteries**. Hikuma, Koichiro (Sony Corp., Japan). Jpn. Kokai Tokkyo Koho JP 09171827 A2 19970630 Heisei, 5 pp. (Japanese). CODEN: JKXXAF. APPLICATION: JP 1995-350114 19951221.
AB The **cathode** active mass is LixFe2PO4 (0 < x .ltoreq. 1.0). The **batteries** show stable discharge voltage.
IT **192194-49-3P**, Iron lithium phosphate (Fe2Li(PO4))
192194-51-7P, Iron lithium phosphate (Fe2Li1-2(PO4))
(**cathodes**; Fe Li phosphate **cathode** active mass for Li secondary **batteries**)
RN 192194-49-3 HCA
CN Iron lithium phosphate (Fe2Li(PO4)) (9CI) (CA INDEX NAME)

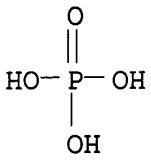
Component	Ratio	Component Registry Number
O4P	1	14265-44-2
Li	1	7439-93-2
Fe	2	7439-89-6

RN 192194-51-7 HCA
CN Iron lithium phosphate (Fe2Li1-2(PO4)) (9CI) (CA INDEX NAME)

Component	Ratio	Component Registry Number
O4P	1	14265-44-2
Li	1 - 2	7439-93-2
Fe	2	7439-89-6

IC ICM H01M004-58
ICS C01B025-45; H01M004-02; H01M010-40
CC **52-2** (Electrochemical, Radiational, and Thermal Energy Technology)
ST lithium iron phosphate **cathode battery**
IT **Battery cathodes**
(Fe Li phosphate **cathode** active mass for Li secondary **batteries**)
IT **192194-49-3P**, Iron lithium phosphate (Fe2Li(PO4))
192194-51-7P, Iron lithium phosphate (Fe2Li1-2(PO4))
(**cathodes**; Fe Li phosphate **cathode** active mass for Li secondary **batteries**)

L55 ANSWER 19 OF 19 HCA COPYRIGHT 2002 ACS
118:204178 A carbon dioxide gas sensor based on the lithium ionic **conductor**. Imanaka, Nobuhito (Fac. Eng., Osaka Univ., Suita, 565, Japan). Kenkyu Hokoku - Asahi Garasu Zaidan, 60, 91-7 (Japanese) 1992. CODEN: KHAZE2. ISSN: 0916-7064.
AB The prepn. and performance of the title sensor with Li2CO3 or Li2CO3-K2CO3-Na2CO3 (47.6:25.4:27.0) detecting electrode and CaCO3 ref. electrode and using LiTi2(PO4)3+0.2Li3PO4 solid **electrolyte** were reported. The response of the sensor (sample gas, Li2CO3/LiTi2(PO4)3+0.2Li3PO4/CaCO3) agreed well with the theor. emf. of the **galvanic cell** at the CO2 concn. of 80 ppm-1% and at 650.degree.. The presence of NO2 at 100-1500 ppm did not affect the value of emf., but of SO2 at 20 ppm or over **reduced** the emf. at 650.degree.. The presence of the steam did not affect the value of emf. at 650.degree.. The sensor (sample gas, Li2CO3-K2CO3-Na2CO3/LiTi2(PO4)3+0.2Li3PO4/CaCO3) detected the CO2 concn. of 100 ppm-1% even at 350.degree..
IT **30622-39-0**
(solid **electrolyte** contg. lithium phosphate and, in prepn. of carbon dioxide gas sensor)
RN 30622-39-0 HCA
CN Phosphoric acid, lithium titanium(4+) salt (3:1:2) (8CI, 9CI) (CA INDEX NAME)



●1/3 Li

●2/3 Ti(IV)

CC 79-2 (Inorganic Analytical Chemistry)
Section cross-reference(s): **72**
ST lithium ionic **conductor** carbon dioxide sensor; gas sensor solid **electrolyte** carbon dioxide
IT Sensors
(gas, electrochem., solid-state, lithium ionic **conductor** -based, for carbon dioxide)
IT 124-38-9, Carbon dioxide, analysis
(detn. of, lithium ionic **conductor**-based gas sensor prepn. for)
IT **30622-39-0**
(solid **electrolyte** contg. lithium phosphate and, in prepn. of carbon dioxide gas sensor)
IT 10377-52-3, Lithium phosphate
(solid **electrolyte** contg. lithium titanium phosphate and, in prepn. of carbon dioxide gas sensor)

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L56 ANSWER 1 OF 15 HCA COPYRIGHT 2002 ACS
137:265592 secondary lithium **battery**. Fujita, Shigeru; Akashi, Hiroyuki; Adachi, Momoe; Shibamoto, Goro (Sony Corp., Japan). Jpn. Kokai Tokkyo Koho JP 2002279989 A2 20020927, 13 pp. (Japanese). CODEN: JKXXAF. APPLICATION: JP 2001-77086 20010316.
AB The **battery** has a Li intercalating and depositing anode and a oxide **cathode** active mass contg. Li, P and .gtoreq.1 of Fe, Mn and Co. The **cathode** may also contain a 2nd oxide active mass contg. Li and .gtoreq.1 of Co, Ni, and Mn. The anode active mass is selected from Li intercalating carbonaceous materials and metals, semiconductors, alloys, and compds. capable of alloying with Li.
IT **213467-46-0**, Iron lithium manganese phosphate [FeLi2Mn(PO4)2]

(compns. of oxide **cathodes** for secondary lithium **batteries** with lithium intercalating and depositing anodes)

RN 213467-46-0 HCA

CN Iron lithium manganese phosphate (FeLi2Mn(PO4)2) (9CI) (CA INDEX NAME)

Component	Ratio	Component Registry Number
O4P	2	14265-44-2
Mn	1	7439-96-5
Li	2	7439-93-2
Fe	1	7439-89-6

IC ICM H01M004-58
ICS H01M004-02; H01M004-38; H01M010-40

CC **52-2** (Electrochemical, Radiational, and Thermal Energy Technology)

ST secondary lithium **battery** mixed metal oxide **cathode**; phosphorus metal oxide **cathode** compn secondary **battery**

IT **Battery cathodes**
(compns. of oxide **cathodes** for secondary lithium **batteries** with lithium intercalating and depositing anodes)

IT **Battery** anodes
(lithium intercalating and depositing anodes for secondary lithium **batteries** with oxide **cathodes**)

IT Carbonaceous materials (technological products)
(lithium intercalating and depositing anodes for secondary lithium **batteries** with oxide **cathodes**)

IT Secondary **batteries**
(lithium; secondary lithium **batteries** with oxide **cathodes** and lithium intercalating and depositing anodes)

IT 12057-17-9, Lithium manganese oxide (LiMn2O4) 12190-79-3, Cobalt lithium oxide (CoLiO2) 15365-14-7, Iron lithium phosphate (FeLiPO4) 113066-89-0, Cobalt lithium nickel oxide (Co0.2LiNi0.8O2) **213467-46-0**, Iron lithium manganese phosphate [FeLi2Mn(PO4)2]
(compns. of oxide **cathodes** for secondary lithium **batteries** with lithium intercalating and depositing anodes)

IT 7429-90-5, Aluminum, uses 7439-92-1, Lead, uses 7439-95-4, Magnesium, uses 7440-21-3, Silicon, uses 7440-22-4, Silver, uses 7440-31-5, Tin, uses 7440-36-0, Antimony, uses 7440-38-2, Arsenic, uses 7440-42-8, Boron, uses 7440-43-9, Cadmium, uses 7440-55-3, Gallium, uses 7440-56-4, Germanium, uses 7440-58-6, Hafnium, uses 7440-65-5, Yttrium, uses 7440-66-6, Zinc, uses 7440-67-7, Zirconium, uses 7440-69-9, Bismuth, uses 7440-74-6, Indium, uses 7782-42-5, Graphite, uses
(lithium intercalating and depositing anodes for secondary

lithium **batteries** with oxide **cathodes**)

L56 ANSWER 2 OF 15 HCA COPYRIGHT 2002 ACS
137:219425 7Li and 31P magic angle spinning nuclear magnetic resonance of LiFePO4-type materials. Tucker, Michael C.; Doeff, Marca M.; Richardson, Thomas J.; Finones, Rita; Reimer, Jeffrey A.; Cairns, Elton J. (Energy and Environmental Technologies Division, Ernest Orlando Lawrence Berkeley National Laboratory and Department of Chemical Engineering, University of California Berkeley, Berkeley, CA, 94720, USA). Electrochemical and Solid-State Letters, 5(5), A95-A98 (English) 2002. CODEN: ESLEF6. ISSN: 1099-0062. Publisher: Electrochemical Society.

AB LiFePO4 and LiMnPO4 were characterized using 7Li and 31P magic angle spinning (MAS) NMR spectroscopy. LiFePO4 was synthesized by a hydrothermal route and LiMnPO4 was synthesized at high temp. in an inert atm. Both compns. give rise to single isotropic 7Li resonances. The MAS isotropic peak linewidth for LiFePO4 is considerably larger than that for LiMnPO4, suggesting the presence of local disorder in the Li coordination sphere for LiFePO4. In both samples, the isotropic peak is accompanied by a large, asym. spinning sideband manifold, arising from bulk magnetic susceptibility broadening and the paramagnetic interaction between the lithium nucleus and transition metal unpaired electrons.

IT **19414-36-9**, Iron lithium manganese phosphate ((Fe,Mn)Li(PO4))
(Li and 31P magic angle spinning NMR of LiFePO4-type materials)

RN 19414-36-9 HCA

CN Iron lithium manganese phosphate ((Fe,Mn)Li(PO4)) (9CI) (CA INDEX NAME)

Component	Ratio	Component Registry Number
O4P	1	14265-44-2
Mn	0 - 1	7439-96-5
Li	1	7439-93-2
Fe	0 - 1	7439-89-6

CC **52-2** (Electrochemical, Radiational, and Thermal Energy Technology)
Section cross-reference(s): 67, 77

ST magic angle spinning NMR lithium phosphorus phosphate **battery cathode**; secondary **battery cathode** lithium iron magnesium phosphate magnetic susceptibility

IT **Battery cathodes**
MAS NMR spectroscopy
Magnetic susceptibility
Paramagnetic centers
Solid state secondary **batteries**
(Li and 31P magic angle spinning NMR of LiFePO4-type materials)

IT **19414-36-9**, Iron lithium manganese phosphate

((Fe,Mn)Li(PO4))
(Li and 31P magic angle spinning NMR of LiFePO4-type materials)

L56 ANSWER 3 OF 15 HCA COPYRIGHT 2002 ACS
137:35475 **Nonaqueous electrolyte battery.**
Goto, Shuji (Sony Corp., Japan). Jpn. Kokai Tokkyo Koho JP 2002170567 A2 20020614, 9 pp. (Japanese). CODEN: JKXXAF. APPLICATION: JP 2000-369000 20001204.
AB The **battery** has a coiled stack contg. a separator between an anode and a **cathode** in a laminated film package, where the **cathode** is LixFe1-yMyPO4 (0.05 .ltoreq.x .ltoreq.1.2, y .ltoreq.0.8, M = Mn, Cr, Co, Cu, Ni, Y, Mo, Ti, Zr, Al, Ga, Mg, b, and/or Nb). The **cathode** may also contain other active mass having lower discharge potential than the phosphate.
IT **412351-36-1**, Iron lithium manganese phosphate (Fe0.9LiMn0.1(PO4))
(compns. of substituted iron lithium phosphate **cathodes** for secondary lithium **batteries**)
RN 412351-36-1 HCA
CN Iron lithium manganese phosphate (Fe0.9LiMn0.1(PO4)) (9CI) (CA INDEX NAME)

Component	Ratio	Component Registry Number
O4P	1	14265-44-2
Mn	0.1	7439-96-5
Li	1	7439-93-2
Fe	0.9	7439-89-6

IC ICM H01M004-58
ICS H01M004-02; H01M010-40
CC **52-2** (Electrochemical, Radiational, and Thermal Energy Technology)
ST **battery cathode** substituted lithium iron phosphate
IT **Battery cathodes**
(compns. of substituted iron lithium phosphate **cathodes** for secondary lithium **batteries**)
IT 12031-65-1, Lithium nickel oxide (LiNiO2) 12057-17-9, Lithium manganese oxide (LiMn2O4) 12190-79-3, Cobalt lithium oxide (CoLiO2) 15365-14-7, Iron lithium phosphate (FeLiPO4) 116327-69-6, Cobalt lithium nickel oxide (Co0.1LiNi0.9O2) 147812-18-8, Iron lithium manganese oxide (Fe0.05LiMn1.95O4) 408332-58-1, Aluminum cobalt lithium nickel oxide (Al0.01Co0.98LiNi0.01O2) **412351-36-1**, Iron lithium manganese phosphate (Fe0.9LiMn0.1(PO4))
(compns. of substituted iron lithium phosphate **cathodes** for secondary lithium **batteries**)

L56 ANSWER 4 OF 15 HCA COPYRIGHT 2002 ACS
136:357523 **Cathode** active mass and **batt ry** using the

active mass. Li, Guohua (Sony Corporation, Japan). PCT Int. Appl. WO 2002039523 A1 20020516, 28 pp. DESIGNATED STATES: W: CA, CN, KR, MX, US; RW: DE, FI, FR, GB, SE. (Japanese). CODEN: PIXXD2. APPLICATION: WO 2001-JP9747 20011107. PRIORITY: JP 2000-342410 20001109.

AB The **cathode** active mass contains Li1+xMnyFezPO4 (0 <x <0.1, 0.5 <y <0.95, 0.9 <(y+z) .ltoreq.1. The **battery** is a secondary Li **battery**.

IT **421766-60-1**, Iron lithium manganese phosphate (Fe0.05-0.5Li1-1.1Mn0.5-0.95(PO4)) **421766-61-2**, Iron lithium manganese phosphate (Fe0.27Li1.03Mn0.7(PO4)) **421766-62-3**, Iron lithium manganese phosphate (Fe0.25Li1.05Mn0.7(PO4)) **421766-63-4**, Iron lithium manganese phosphate (Fe0.22Li1.03Mn0.75(PO4)) **421766-64-5**, Iron lithium manganese phosphate (Fe0.2Li1.05Mn0.75(PO4)) **421766-65-6**, Iron lithium manganese phosphate (Fe0.25Li1.03Mn0.75(PO4))
(compns. of lithium iron manganese phosphate active mass for secondary lithium **batteries**)

RN 421766-60-1 HCA

CN Iron lithium manganese phosphate (Fe0.05-0.5Li1-1.1Mn0.5-0.95(PO4)) (9CI) (CA INDEX NAME)

Component	Ratio	Component Registry Number
O4P	1	14265-44-2
Mn	0.5 - 0.95	7439-96-5
Li	1 - 1.1	7439-93-2
Fe	0.05 - 0.5	7439-89-6

RN 421766-61-2 HCA

CN Iron lithium manganese phosphate (Fe0.27Li1.03Mn0.7(PO4)) (9CI) (CA INDEX NAME)

Component	Ratio	Component Registry Number
O4P	1	14265-44-2
Mn	0.7	7439-96-5
Li	1.03	7439-93-2
Fe	0.27	7439-89-6

RN 421766-62-3 HCA

CN Iron lithium manganese phosphate (Fe0.25Li1.05Mn0.7(PO4)) (9CI) (CA INDEX NAME)

Component	Ratio	Component Registry Number
O4P	1	14265-44-2
Mn	0.7	7439-96-5

Li	1.05	7439-93-2
Fe	0.25	7439-89-6

RN 421766-63-4 HCA
CN Iron lithium manganese phosphate (Fe0.22Li1.03Mn0.75(PO4)) (9CI) (CA INDEX NAME)

Component	Ratio	Component Registry Number
O4P	1	14265-44-2
Mn	0.75	7439-96-5
Li	1.03	7439-93-2
Fe	0.22	7439-89-6

RN 421766-64-5 HCA
CN Iron lithium manganese phosphate (Fe0.2Li1.05Mn0.75(PO4)) (9CI) (CA INDEX NAME)

Component	Ratio	Component Registry Number
O4P	1	14265-44-2
Mn	0.75	7439-96-5
Li	1.05	7439-93-2
Fe	0.2	7439-89-6

RN 421766-65-6 HCA
CN Iron lithium manganese phosphate (Fe0.25Li1.03Mn0.75(PO4)) (9CI) (CA INDEX NAME)

Component	Ratio	Component Registry Number
O4P	1	14265-44-2
Mn	0.75	7439-96-5
Li	1.03	7439-93-2
Fe	0.25	7439-89-6

IC ICM H01M004-58
ICS H01M004-02; H01M010-40
CC **52-2** (Electrochemical, Radiational, and Thermal Energy Technology)
ST secondary **battery cathode** lithium manganese iron phosphate
IT **Battery cathodes**
(compns. of lithium iron manganese phosphate active mass for secondary lithium **batteries**)
IT **421766-60-1**, Iron lithium manganese phosphate (Fe0.05-0.5Li1-1.1Mn0.5-0.95(PO4)) **421766-61-2**, Iron lithium manganese phosphate (Fe0.27Li1.03Mn0.7(PO4)) **421766-62-3**, Iron lithium manganese phosphate

(Fe0.25Li1.05Mn0.7(PO4)) **421766-63-4**, Iron lithium manganese phosphate (Fe0.22Li1.03Mn0.75(PO4)) **421766-64-5**, Iron lithium manganese phosphate (Fe0.2Li1.05Mn0.75(PO4)) **421766-65-6**, Iron lithium manganese phosphate (Fe0.25Li1.03Mn0.75(PO4))
(compns. of lithium iron manganese phosphate active mass for secondary lithium **batteries**)

L56 ANSWER 5 OF 15 HCA COPYRIGHT 2002 ACS
136:328121 Lithium-iron complex oxide for active mix of lithium secondary **battery positive electrode**.
Kanzaki, Masao; Takeuchi, Youji; Ukyo, Yoshio (Toyota Central Research and Development Laboratories, Inc., Japan). Jpn. Kokai Tokkyo Koho JP 2002117845 A2 20020419, 8 pp. (Japanese). CODEN: JKXXAF. APPLICATION: JP 2000-307685 20001006.

AB Lithium-iron complex oxide for active mix of lithium secondary **battery pos. electrode** is LiFe1-xMxPO4 (M = Mn, Mg, Ni, Co; x = 0.02-0.2) with olivine crystal structure. The active mix preferably has a particle size of .ltoreq.1 .mu.m. The **battery** has a large discharge capacity of active mix and good cycle life.

IT **412351-36-1**, Iron lithium manganese phosphate (Fe0.9LiMn0.1(PO4))
(lithium-iron complex oxide for active mix of lithium secondary **battery pos. electrode**)
RN 412351-36-1 HCA
CN Iron lithium manganese phosphate (Fe0.9LiMn0.1(PO4)) (9CI) (CA INDEX NAME)

Component	Ratio	Component Registry Number
O4P	1	14265-44-2
Mn	0.1	7439-96-5
Li	1	7439-93-2
Fe	0.9	7439-89-6

IC ICM H01M004-58
ICS C01G049-00; H01M004-02; H01M010-40
CC **52-2** (Electrochemical, Radiational, and Thermal Energy Technology)
ST lithium iron complex oxide secondary **battery**
IT **Battery cathodes**
(lithium-iron complex oxide for active mix of lithium secondary **battery pos. electrode**)
IT Olivine-group minerals
(lithium-iron complex oxide for active mix of lithium secondary **battery pos. electrode**)
IT **412351-36-1**, Iron lithium manganese phosphate (Fe0.9LiMn0.1(PO4))
(lithium-iron complex oxide for active mix of lithium secondary **battery pos. electrode**)

L56 ANSWER 6 OF 15 HCA COPYRIGHT 2002 ACS
136:297401 **Nonaqueous electrolyte battery** with high discharge capacity. Sakai, Hidecki; Fukushima, Yuzuru; Kuyama, Junji; Hosoya, Mamoru (Sony Corporation, Japan). Eur. Pat. Appl. EP 1195838 A2 20020410, 17 pp. DESIGNATED STATES: R: AT, BE, CH, DE, DK, ES, FR, GB, GR, IT, LI, LU, NL, SE, MC, PT, IE, SI, LT, LV, FI, RO. (English). CODEN: EPXXDW. APPLICATION: EP 2001-123895 20011005. PRIORITY: JP 2000-308303 20001006.

AB A **nonaq. electrolyte cell** is disclosed having high discharge capacity, an improved capacity upkeep ratio and optimum cyclic characteristics. The **nonaq. electrolyte cell** has a cell device including a strip-shaped **cathode** material and a strip-shaped anode material, layered and together via a separator and coiled a plural no. of times, a **nonaq. electrolyte** soln., and a cell can for accommodating cell device and the **nonaq. electrolyte** soln. The **cathode** employs a **cathode** active material contg. a compd. of the olivinic structure represented by the general formula LixFe1-yMyPO4, where M is at least one selected from the group consisting of Mn, Cr, Co, Cu, Ni, V, Mo, Ti, Zn, Al, Ga, Mg, B and Nb, with 0.05 .ltoreq. x .ltoreq. 1.2 and 0 .ltoreq. y .ltoreq. 0.8, with the compd. being used either singly or in combination with other materials. The ratio of an inner diam. d to an outer diam. D of cell device is selected so that 0.05 < d/D < 0.5.

IT **407606-34-2**, Iron lithium manganese phosphate (Fe0.2-1Li0.05-1.2Mn0-0.8(PO4))
(**nonaq. electrolyte battery** with high discharge capacity)

RN 407606-34-2 HCA

CN Iron lithium manganese phosphate (Fe0.2-1Li0.05-1.2Mn0-0.8(PO4)) (9CI) (CA INDEX NAME)

Component	Ratio	Component Registry Number
O4P	1	14265-44-2
Mn	0 - 0.8	7439-96-5
Li	0.05 - 1.2	7439-93-2
Fe	0.2 - 1	7439-89-6

IC ICM H01M010-40
ICS H01M004-58

CC **52-2** (Electrochemical, Radiational, and Thermal Energy Technology)

ST **battery nonaq electrolyte** high discharge capacity

IT Secondary **batteries**
(lithium; **nonaq. electrolyte battery** with high discharge capacity)

IT **Battery cathodes**

(**nonaq. electrolyte battery** with high discharge capacity)

IT Carbon black, uses
(**nonaq. electrolyte battery** with high discharge capacity)

IT Lithium alloy, base
(**nonaq. electrolyte battery** with high discharge capacity)

IT 7439-93-2, Lithium, uses 15365-14-7, Iron lithium phosphate felipo4 407606-22-8, Chromium iron lithium phosphate (Cr0-0.8Fe0.2-1Li0.05-1.2(PO4)) 407606-24-0, Cobalt iron lithium phosphate (Co0-0.8Fe0.2-1Li0.05-1.2(PO4)) 407606-26-2, Copper iron lithium phosphate (Cu0-0.8Fe0.2-1Li0.05-1.2(PO4)) 407606-28-4, Aluminum iron lithium phosphate (Al0-0.8Fe0.2-1Li0.05-1.2(PO4)) 407606-30-8, Gallium iron lithium phosphate (Ga0-0.8Fe0.2-1Li0.05-1.2(PO4)) 407606-32-0, Boron iron lithium phosphate (B0-0.8Fe0.2-1Li0.05-1.2(PO4)) **407606-34-2**, Iron lithium manganese phosphate (Fe0.2-1Li0.05-1.2Mn0-0.8(PO4)) 407606-36-4, Iron lithium nickel phosphate (Fe0.2-1Li0.05-1.2Ni0-0.8(PO4)) 407606-39-7, Iron lithium vanadium phosphate (Fe0.2-1Li0.05-1.2V0-0.8(PO4)) 407606-42-2, Iron lithium molybdenum phosphate (Fe0.2-1Li0.05-1.2Mo0-0.8(PO4)) 407606-44-4, Iron lithium titanium phosphate (Fe0.2-1Li0.05-1.2Ti0-0.8(PO4)) 407606-47-7, Iron lithium zinc phosphate (Fe0.2-1Li0.05-1.2Zn0-0.8(PO4)) 407606-49-9, Iron lithium magnesium phosphate (Fe0.2-1Li0.05-1.2Mg0-0.8(PO4)) 407606-51-3, Iron lithium niobium phosphate (Fe0.2-1Li0.05-1.2Nb0-0.8(PO4)) 407629-83-8 407629-87-2 407629-90-7 407629-95-2 407630-01-7 407630-05-1 407630-10-8 407630-14-2 407630-25-5, Aluminum iron lithium phosphate (Al0.7Fe0.3Li(PO4)) 407630-29-9, Gallium iron lithium phosphate (Ga0.7Fe0.3Li(PO4)) 407630-35-7 407630-40-4, Boron iron lithium phosphate (B0.75Fe0.25Li(PO4)) 408501-54-2
(**nonaq. electrolyte battery** with high discharge capacity)

L56 ANSWER 7 OF 15 HCA COPYRIGHT 2002 ACS

136:297400 **Nonaqueous electrolyte** secondary **battery** using olivinic lithium phosphorus oxide **cathode** active material. Okawa, Tsuyoshi; Hosoya, Mamoru; Kuyama, Junji; Fukushima, Yuzuru (Sony Corporation, Japan). Eur. Pat. Appl. EP 1195837 A2 20020410, 15 pp. DESIGNATED STATES: R: AT, BE, CH, DE, DK, ES, FR, GB, GR, IT, LI, LU, NL, SE, MC, PT, IE, SI, LT, LV, FI, RO. (English). CODEN: EPXXDW. APPLICATION: EP 2001-123893 20011005. PRIORITY: JP 2000-308302 20001006.

AB In a **battery**, liq. leakage or destruction may be prevented as the apparent energy d. per unit vol. of the cell is maintained. The cell uses, as a **cathode** active material, a compd. of an olivinic crystal structure having the formula LixFe1-xMyPO4, where M is at least one selected from the group of Mn, Cr, Co, Cu, Ni, V, Mo, Ti, Zn, Al, Ga, Mg, B and Nb and 0.05 .ltoreq. x .ltoreq. 1.2 and 0 .ltoreq. y .ltoreq. 0.8. By adjusting the amt. of the **electrolyte** soln., the amt. of the void in the container is

set so as to be not less than 0.14 mL and not more than 3.3 mL per 1 Ah of the cell capacity.

IT **407606-34-2**, Iron lithium manganese phosphate (Fe0.2-1Li0.05-1.2Mn0-0.8(PO4))
(**nonaq. electrolyte** secondary **battery** using olivinic lithium phosphorus oxide **cathode** active material)

RN 407606-34-2 HCA

CN Iron lithium manganese phosphate (Fe0.2-1Li0.05-1.2Mn0-0.8(PO4)) (9CI) (CA INDEX NAME)

Component	Ratio	Component Registry Number
O4P	1	14265-44-2
Mn	0 - 0.8	7439-96-5
Li	0.05 - 1.2	7439-93-2
Fe	0.2 - 1	7439-89-6

IC ICM H01M010-40
ICS H01M004-58

CC **52-2** (Electrochemical, Radiational, and Thermal Energy Technology)

ST **battery** olivinic lithium phosphorus oxide **cathode** ; **nonaq electrolyte** lithium secondary **battery**

IT Secondary **batteries**
(lithium; **nonaq. electrolyte** secondary **battery** using olivinic lithium phosphorus oxide **cathode** active material)

IT **Battery cathodes**
Composites
(**nonaq. electrolyte** secondary **battery** using olivinic lithium phosphorus oxide **cathode** active material)

IT Coke
(pitch; **nonaq. electrolyte** secondary **battery** using olivinic lithium phosphorus oxide **cathode** active material)

IT 108-32-7, Propylene carbonate 616-38-6, Dimethyl carbonate 7440-44-0, Carbon, uses 15365-14-7, Iron lithium phosphate felipo4 21324-40-3, Lithium hexafluorophosphate 407606-22-8, Chromium iron lithium phosphate (Cr0-0.8Fe0.2-1Li0.05-1.2(PO4)) 407606-24-0, Cobalt iron lithium phosphate (Co0-0.8Fe0.2-1Li0.05-1.2(PO4)) 407606-26-2, Copper iron lithium phosphate (Cu0-0.8Fe0.2-1Li0.05-1.2(PO4)) 407606-28-4, Aluminum iron lithium phosphate (Al0-0.8Fe0.2-1Li0.05-1.2(PO4)) 407606-30-8, Gallium iron lithium phosphate (Ga0-0.8Fe0.2-1Li0.05-1.2(PO4)) 407606-32-0, Boron iron lithium phosphate (B0-0.8Fe0.2-1Li0.05-1.2(PO4)) **407606-34-2**, Iron lithium manganese phosphate (Fe0.2-1Li0.05-1.2Mn0-0.8(PO4)) 407606-36-4, Iron lithium nickel phosphate (Fe0.2-1Li0.05-1.2Ni0-0.8(PO4)) 407606-39-7, Iron lithium vanadium phosphate

(Fe0.2-1Li0.05-1.2V0-0.8(PO4)) 407606-42-2, Iron lithium molybdenum phosphate (Fe0.2-1Li0.05-1.2Mo0-0.8(PO4)) 407606-44-4, Iron lithium titanium phosphate (Fe0.2-1Li0.05-1.2Ti0-0.8(PO4)) 407606-47-7, Iron lithium zinc phosphate (Fe0.2-1Li0.05-1.2Zn0-0.8(PO4)) 407606-49-9, Iron lithium magnesium phosphate (Fe0.2-1Li0.05-1.2Mg0-0.8(PO4)) 407606-51-3, Iron lithium niobium phosphate (Fe0.2-1Li0.05-1.2Nb0-0.8(PO4)) 407629-83-8 407629-87-2 407629-90-7 407629-95-2 407630-01-7 407630-05-1 407630-10-8 407630-14-2 407630-19-7 407630-25-5, Aluminum iron lithium phosphate (Al0.7Fe0.3Li(PO4)) 407630-29-9, Gallium iron lithium phosphate (Ga0.7Fe0.3Li(PO4)) 407630-35-7 - 407630-40-4, Boron iron lithium phosphate (B0.75Fe0.25Li(PO4)) 407630-46-0
(**nonaq. electrolyte** secondary **battery** using olivinic lithium phosphorus oxide **cathode** active material)

L56 ANSWER 8 OF 15 HCA COPYRIGHT 2002 ACS
136:297398 **Cathode** and anode materials for solid **nonaqueous electrolyte battery**.
Takahashi, Kimio; Hosoya, Mamoru; Miyake, Masami (Sony Corporation, Japan). Eur. Pat. Appl. EP 1195835 A2 20020410, 22 pp. DESIGNATED STATES: R: AT, BE, CH, DE, DK, ES, FR, GB, GR, IT, LI, LU, NL, SE, MC, PT, IE, SI, LT, LV, FI, RO. (English). CODEN: EPXXDW. APPLICATION: EP 2001-123773 20011004. PRIORITY: JP 2000-306877 20001005.

AB A **battery** is not deteriorated in cell characteristics and maintains the cell shape encapsulated in a laminate film even when overdischarged to a cell voltage of 0 V. The cell includes a **cathode** contg. a compd. having the formula LixFe1-yMyPO4, where M is at least one selected from the group consisting of Mn, Cr, Co, Cu, Ni, V, Mo, Ti, Zn, Al, Ga, Mg, B and Nb, with 0.05 .ltoreq. x .ltoreq. 1.2 and 0 .ltoreq. y .ltoreq. 0.8, an anode and a solid **electrolyte**. A cell member comprised of the **cathode** and the anode, layered together with the interposition of a solid **electrolyte**, is encapsulated in a laminate film.

IT **407606-34-2**, Iron lithium manganese phosphate (Fe0.2-1Li0.05-1.2Mn0-0.8(PO4))
(**cathode** and anode materials for solid **nonaq. electrolyte battery**)

RN 407606-34-2 HCA
CN Iron lithium manganese phosphate (Fe0.2-1Li0.05-1.2Mn0-0.8(PO4)) (9CI) (CA INDEX NAME)

Component	Ratio	Component Registry Number
O4P	1	14265-44-2
Mn	0 - 0.8	7439-96-5
Li	0.05 - 1.2	7439-93-2
Fe	0.2 - 1	7439-89-6

IC ICM H01M010-40
ICS H01M004-58
CC **52-2** (Electrochemical, Radiational, and Thermal Energy Technology)
ST **battery** solid **nonaq electrolyte** **cathode** anode material
IT **Battery** anodes
Battery cathodes
Battery electrolytes
(**cathode** and anode materials for solid **nonaq**. **electrolyte battery**)
IT 7440-44-0, Carbon, uses 15365-14-7, Iron lithium phosphate felipo4 407606-22-8, Chromium iron lithium phosphate (Cr0-0.8Fe0.2-1Li0.05-1.2(PO4)) 407606-24-0, Cobalt iron lithium phosphate (Co0-0.8Fe0.2-1Li0.05-1.2(PO4)) 407606-26-2, Copper iron lithium phosphate (Cu0-0.8Fe0.2-1Li0.05-1.2(PO4)) 407606-28-4, Aluminum iron lithium phosphate (Al0-0.8Fe0.2-1Li0.05-1.2(PO4)) 407606-30-8, Gallium iron lithium phosphate (Ga0-0.8Fe0.2-1Li0.05-1.2(PO4)) 407606-32-0, Boron iron lithium phosphate (B0-0.8Fe0.2-1Li0.05-1.2(PO4)) **407606-34-2**, Iron lithium manganese phosphate (Fe0.2-1Li0.05-1.2Mn0-0.8(PO4)) 407606-36-4, Iron lithium nickel phosphate (Fe0.2-1Li0.05-1.2Ni0-0.8(PO4)) 407606-39-7, Iron lithium vanadium phosphate (Fe0.2-1Li0.05-1.2V0-0.8(PO4)) 407606-42-2, Iron lithium molybdenum phosphate (Fe0.2-1Li0.05-1.2Mo0-0.8(PO4)) 407606-44-4, Iron lithium titanium phosphate (Fe0.2-1Li0.05-1.2Ti0-0.8(PO4)) 407606-47-7, Iron lithium zinc phosphate (Fe0.2-1Li0.05-1.2Zn0-0.8(PO4)) 407606-49-9, Iron lithium magnesium phosphate (Fe0.2-1Li0.05-1.2Mg0-0.8(PO4)) 407606-51-3, Iron lithium niobium phosphate (Fe0.2-1Li0.05-1.2Nb0-0.8(PO4))
(**cathode** and anode materials for solid **nonaq**. **electrolyte battery**)
IT 7439-93-2, Lithium, uses
(**cathode** and anode materials for solid **nonaq**. **electrolyte battery**)

L56 ANSWER 9 OF 15 HCA COPYRIGHT 2002 ACS
136:297394 Solid **electrolyte cell**. Goto, Shuji; Hosoya, Mamoru; Endo, Takahiro (Sony Corporation, Japan). Eur. Pat. Appl. EP 1195826 A2 20020410, 16 pp. DESIGNATED STATES: R: AT, BE, CH, DE, DK, ES, FR, GB, GR, IT, LI, LU, NL, SE, MC, PT, IE, SI, LT, LV, FI, RO. (English). CODEN: EPXXDW. APPLICATION: EP 2001-123774 20011004. PRIORITY: JP 2000-306876 20001005.
AB A solid **electrolyte cell** in which cell characteristics are not deteriorated even on overdischarge to the cell voltage of 0 V, such that the shape of the cell encapsulated in the laminate film is maintained. The cell includes a **cathode** contg. a compd. represented by the general formula LixFe1-yMyPO4 where 0.05 .ltoreq. x .ltoreq. 1.2, 0 .ltoreq. y .ltoreq. 0.8, and M is at least one selected from the group consisting of Mn, Cr, Co, Cu, Ni, V, Mo, Ti, Zn, Al, Ga, Mg, B and Nb, an anode and a solid **electrolyte**. An electrode unit 1

comprised of the **cathode** and the anode layered together with interposition of the solid **electrolyte** is encapsulated with a laminate film 2.

IT **407606-34-2**, Iron lithium manganese phosphate (Fe0.2-1Li0.05-1.2Mn0-0.8(PO4))
(solid **electrolyte cell**)

RN 407606-34-2 HCA

CN Iron lithium manganese phosphate (Fe0.2-1Li0.05-1.2Mn0-0.8(PO4)) (9CI) (CA INDEX NAME)

Component	Ratio	Component Registry Number
O4P	1	14265-44-2
Mn	0 - 0.8	7439-96-5
Li	0.05 - 1.2	7439-93-2
Fe	0.2 - 1	7439-89-6

IC ICM H01M004-58
ICS H01M010-40

CC **52-2** (Electrochemical, Radiational, and Thermal Energy Technology)

ST **battery** solid **electrolyte**

IT Polyoxyalkylenes, uses
(lithium complex; solid **electrolyte cell**)

IT **Battery cathodes**
Secondary **batteries**
(solid **electrolyte cell**)

IT Fluoropolymers, uses
(solid **electrolyte cell**)

IT 7439-93-2D, Lithium, polyethylene oxide complex 7791-03-9, Lithium perchlorate 12031-65-1, Lithium nickel oxide linio2 12057-17-9, Lithium manganese oxide limn2o4 15365-14-7, Iron lithium phosphate felipo4 25322-68-3D, Polyethylene oxide, lithium complex 116327-69-6, Cobalt lithium nickel oxide Co0.1LiNi0.9O2 147812-18-8, Iron lithium manganese oxide Fe0.05LiMn1.95O4 407606-22-8, Chromium iron lithium phosphate (Cr0-0.8Fe0.2-1Li0.05-1.2(PO4)) 407606-24-0, Cobalt iron lithium phosphate (Co0-0.8Fe0.2-1Li0.05-1.2(PO4)) 407606-26-2, Copper iron lithium phosphate (Cu0-0.8Fe0.2-1Li0.05-1.2(PO4)) 407606-28-4, Aluminum iron lithium phosphate (Al0-0.8Fe0.2-1Li0.05-1.2(PO4)) 407606-30-8, Gallium iron lithium phosphate (Ga0-0.8Fe0.2-1Li0.05-1.2(PO4)) 407606-32-0, Boron iron lithium phosphate (B0-0.8Fe0.2-1Li0.05-1.2(PO4)) **407606-34-2**, Iron lithium manganese phosphate (Fe0.2-1Li0.05-1.2Mn0-0.8(PO4)) 407606-36-4, Iron lithium nickel phosphate (Fe0.2-1Li0.05-1.2Ni0-0.8(PO4)) 407606-39-7, Iron lithium vanadium phosphate (Fe0.2-1Li0.05-1.2V0-0.8(PO4)) 407606-42-2, Iron lithium molybdenum phosphate (Fe0.2-1Li0.05-1.2Mo0-0.8(PO4)) 407606-44-4, Iron lithium titanium phosphate (Fe0.2-1Li0.05-1.2Ti0-0.8(PO4)) 407606-47-7, Iron lithium zinc phosphate (Fe0.2-1Li0.05-1.2Zn0-0.8(PO4)) 407606-49-9, Iron lithium magnesium phosphate (Fe0.2-1Li0.05-1.2Mg0-

0.8(PO4)) 407606-51-3, Iron lithium niobium phosphate (Fe0.2-1Li0.05-1.2Nb0-0.8(PO4)) 408331-94-2, Cobalt lithium nickel oxide ((Co,Ni)Li0-2O2) 408331-95-3, Cobalt lithium manganese oxide ((Co,Mn)Li0-2O2) 408331-96-4, Cobalt lithium zinc oxide ((Co,Zn)Li0-2O2) 408331-97-5, Cobalt lithium tin oxide ((Co,Sn)Li0-2O2) 408331-99-7, Cobalt lithium vanadium oxide ((Co,V)Li0-2O2) 408332-00-3, Cobalt lithium titanium oxide ((Co,Ti)Li0-2O2) 408332-01-4, Cobalt lithium molybdenum oxide ((Co,Mo)Li0-2O2) 408332-02-5, Cobalt lithium tungsten oxide ((Co,W)Li0-2O2) 408332-03-6, Cobalt lithium magnesium oxide ((Co,Mg)Li0-2O2) 408332-04-7, Cobalt lithium strontium oxide ((Co,Sr)Li0-2O2) 408332-05-8, Cobalt lithium niobium oxide ((Co,Nb)Li0-2O2) 408332-06-9, Cobalt iron lithium oxide ((Co,Fe)Li0-2O2) 408332-07-0, Cobalt copper lithium oxide ((Co,Cu)Li0-2O2) 408332-08-1, Aluminum cobalt lithium oxide ((Al,Co)Li0-2O2) 408332-09-2, Cobalt lithium borate oxide (Co0-1Li0-2(BO2)0-1O0-2) 408332-10-5, Cobalt gallium lithium oxide ((Co,Ga)Li0-2O2) 408332-11-6, Chromium cobalt lithium oxide ((Cr,Co)Li0-2O2) 408332-12-7, Calcium cobalt lithium oxide ((Ca,Co)Li0-2O2) 408332-13-8, Iron lithium nickel oxide ((Fe,Ni)Li0-2O2) 408332-14-9, Copper lithium nickel oxide ((Cu,Ni)Li0-2O2) 408332-15-0, Aluminum lithium nickel oxide ((Al,Ni)Li0-2O2) 408332-16-1, Lithium nickel borate oxide (Li0-2Ni0-1(BO2)0-1O0-2) 408332-17-2, Gallium lithium nickel oxide ((Ga,Ni)Li0-2O2) 408332-18-3, Chromium lithium nickel oxide ((Cr,Ni)Li0-2O2) 408332-19-4, Calcium lithium nickel oxide ((Ca,Ni)Li0-2O2) 408332-20-7, Lithium manganese nickel oxide (Li0-2(Mn,Ni)O2) 408332-21-8, Lithium nickel zinc oxide (Li0-2(Ni,Zn)O2) 408332-22-9, Lithium nickel tin oxide (Li0-2(Ni,Sn)O2) 408332-23-0, Lithium nickel vanadium oxide (Li0-2(Ni,V)O2) 408332-24-1, Lithium nickel titanium oxide (Li0-2(Ni,Ti)O2) 408332-25-2, Lithium nickel tungsten oxide (Li0-2(Ni,W)O2) 408332-26-3, Lithium molybdenum nickel oxide (Li0-2(Mo,Ni)O2) 408332-27-4, Lithium magnesium nickel oxide (Li0-2(Mg,Ni)O2) 408332-28-5, Lithium nickel strontium oxide (Li0-2(Ni,Sr)O2) 408332-29-6, Lithium nickel niobium oxide (Li0-2(Ni,Nb)O2) 408332-30-9, Lithium manganese nickel oxide (Li0-2(Mn,Ni)2O4) 408332-31-0, Lithium manganese zinc oxide (Li0-2(Mn,Zn)2O4) 408332-32-1, Lithium manganese tin oxide (Li0-2(Mn,Sn)2O4) 408332-33-2, Lithium manganese vanadium oxide (Li0-2(Mn,V)2O4) 408332-34-3, Lithium manganese titanium oxide (Li0-2(Mn,Ti)2O4) 408332-35-4, Lithium manganese molybdenum oxide (Li0-2(Mn,Mo)2O4) 408332-36-5, Lithium manganese tungsten oxide (Li0-2(Mn,W)2O4) 408332-37-6, Lithium magnesium manganese oxide (Li0-2(Mg,Mn)2O4) 408332-38-7, Lithium manganese strontium oxide (Li0-2(Mn,Sr)2O4) 408332-39-8, Lithium manganese niobium oxide (Li0-2(Mn,Nb)2O4) 408332-40-1, Iron lithium manganese oxide ((Fe,Mn)2Li0-2O4) 408332-42-3, Cobalt lithium manganese oxide ((Co,Mn)2Li0-2O4) 408332-44-5, Aluminum lithium manganese oxide ((Al,Mn)2Li0-2O4) 408332-45-6, Lithium manganese borate oxide (Li0-2Mn0-2(BO2)0-2O0-4) 408332-46-7, Gallium lithium manganese oxide ((Ga,Mn)2Li0-2O4) 408332-47-8, Chromium lithium manganese

oxide ((Cr,Mn)2Li0-2O4) 408332-48-9, Calcium lithium manganese oxide ((Ca,Mn)2Li0-2O4) 408332-50-3 408332-58-1, Aluminum cobalt lithium nickel oxide (Al0.01Co0.98LiNi0.01O2)
(solid **electrolyte cell**)

IT 96-49-1, Ethylene carbonate 108-32-7, Propylene carbonate 7782-42-5, Graphite, uses 12190-79-3, Cobalt lithium oxide colio2 21324-40-3, Lithium hexafluorophosphate 24937-79-9, Pvdf
(solid **electrolyte cell**)

L56 ANSWER 10 OF 15 HCA COPYRIGHT 2002 ACS
135:346864 **Cathode** for **nonaqueous electrolyte** lithium ion **battery**. Yamada, Atsuo; Yamahira, Takayuki (Sony Corporation, Japan). Eur. Pat. Appl. EP 1150368 A2 20011031, 26 pp. DESIGNATED STATES: R: AT, BE, CH, DE, DK, ES, FR, GB, GR, IT, LI, LU, NL, SE, MC, PT, IE, SI, LT, LV, FI, RO. (English). CODEN: EPXXDW. APPLICATION: EP 2001-109919 20010424. PRIORITY: JP 2000-128998 20000425.

AB The lithium ion cell is improved appreciably in operational stability under special conditions, such as high temps., and exhibits superior characteristics against over-discharging, while guaranteeing compatibility to the operating voltage of a conventional lithium ion cell and an energy d. equiv. to that of the conventional lithium ion cell. To this end, the lithium ion cell includes a **pos. electrode**, a neg. electrode and a **nonaq. electrolyte**, and uses, as a **pos. electrode** active material, a composite material of a first lithium compd. represented by the general formula LixMyPO4, where 0 <x< 2, 0.8 <y< 1.2 and M contains Fe, and a second lithium compd. having a potential holder than the potential of the first lithium compd.

IT **19414-36-9**, Iron lithium manganese phosphate ((Fe,Mn)Li(PO4))
(**cathode** for **nonaq. electrolyte** lithium ion **battery**)

RN 19414-36-9 HCA
CN Iron lithium manganese phosphate ((Fe,Mn)Li(PO4)) (9CI) (CA INDEX NAME)

Component	Ratio	Component Registry Number
O4P	1	14265-44-2
Mn	0 - 1	7439-96-5
Li	1	7439-93-2
Fe	0 - 1	7439-89-6

IC ICM H01M004-58
ICS C01G049-00; C01B025-30; C01B025-45; H01M004-38
CC **52-2** (Electrochemical, Radiational, and Thermal Energy Technology)
ST lithium **nonaq electrolyte cathode**
IT Charcoal

(activated; **cathode** for **nonaq.** **electrolyte** lithium ion **battery**)

IT **Battery cathodes**
(**cathode** for **nonaq.** **electrolyte** lithium ion **battery**)

IT Carbon fibers, uses
Carbonaceous materials (technological products)
Coke
Petroleum coke
(**cathode** for **nonaq.** **electrolyte** lithium ion **battery**)

IT Carbon black, uses
(**cathode** for **nonaq.** **electrolyte** lithium ion **battery**)

IT Fluoropolymers, uses
(**cathode** for **nonaq.** **electrolyte** lithium ion **battery**)

IT Organic compounds, uses
(high mol., sintered; **cathode** for **nonaq.** **electrolyte** lithium ion **battery**)

IT Secondary **batteries**
(lithium; **cathode** for **nonaq.** **electrolyte** lithium ion **battery**)

IT Coke
(needle; **cathode** for **nonaq.** **electrolyte** lithium ion **battery**)

IT Coke
(pitch; **cathode** for **nonaq.** **electrolyte** lithium ion **battery**)

IT Furan resins
Phenolic resins, uses
(sintered and carbonized; **cathode** for **nonaq.** **electrolyte** lithium ion **battery**)

IT 50-21-5D, Lactic acid, ester 60-29-7, Diethyl ether, uses 64-19-7D, Acetic acid, ester, uses 75-05-8, Acetonitrile, uses 79-09-4D, Propionic acid, ester 96-47-9, 2-Methyltetrahydrofuran 96-48-0 96-49-1, Ethylene carbonate 100-66-3, Anisole, uses 105-58-8, Diethyl carbonate 107-12-0, Propionitrile 108-32-7, Propylene carbonate 109-99-9, Thf, uses 110-71-4, 1,2-Dimethoxyethane 126-33-0, Sulfolane 409-21-2, Silicon carbide sic, uses 554-12-1, Methyl propionate 616-38-6, Dimethyl carbonate 623-42-7, Methyl butyrate 623-96-1, Dipropyl carbonate 629-14-1, 1,2-Diethoxyethane 646-06-0, 1,3-Dioxolane 872-36-6, Vinylene carbonate 1072-47-5, 4-Methyl-1,3-dioxolane 1313-08-2 2550-62-1, Lithium methanesulfonate 4437-85-8, Butylene carbonate 7439-93-2, Lithium, uses 7440-50-8, Copper, uses 7447-41-8, Lithium chloride, uses 7550-35-8, Lithium bromide 7782-42-5, Graphite, uses 7791-03-9, Lithium perchlorate 9003-07-0, Polypropylene 12007-81-7, Silicon tetraboride 12008-29-6, Silicon hexaboride 12013-56-8, Calcium disilicide 12017-12-8, Cobalt disilicide 12018-09-6, Chromium disilicide 12022-99-0, Iron disilicide 12032-86-9, Manganese disilicide 12033-76-0,

Silicon nitride oxide Si2N2O 12033-89-5, Silicon nitride, uses 12034-80-9, Niobium disilicide 12039-79-1, Tantalum disilicide 12039-83-7, Titanium silicide TiSi2 12039-87-1, Vanadium disilicide 12039-88-2, Tungsten disilicide 12059-14-2, Nickel silicide (Ni2Si) 12136-78-6, Molybdenum disilicide 12159-07-8, Copper silicide cu5si 12190-79-3, Cobalt lithium oxide colio2 12201-89-7, Nickel disilicide 14283-07-9, Lithium tetrafluoroborate 14485-20-2, Lithium tetraphenylborate 15365-14-7, Iron lithium phosphate FeLiPO4 **19414-36-9**, Iron lithium manganese phosphate ((Fe,Mn)Li(PO4)) 21324-40-3, Lithium hexafluorophosphate 22831-39-6, Magnesium silicide (Mg2Si) 29935-35-1, Lithium hexafluoroarsenate 33454-82-9, Lithium trifluoromethanesulfonate 35678-71-8, Methylsulfolane 90076-65-6 113066-89-0, Cobalt lithium nickel oxide Co0.2LiNi0.8O2 113671-38-8, Silicon oxide SiO0-2 160479-36-7, Lithium tin oxide 178958-56-0, Lithium silicon oxide 300858-61-1 339333-78-7, Zinc silicide ZnSi2 371148-86-6, Tin oxide (SnO0-2) 371148-87-7, Lithium magnesium manganese oxide (LiMg0.2Mn0.8O2)
(**cathode** for **nonaq. electrolyte** lithium ion **battery**)

IT 24937-79-9, Pvdf
(**cathode** for **nonaq. electrolyte** lithium ion **battery**)

IT 7440-44-0, Carbon, uses
(pyrocarbon; **cathode** for **nonaq. electrolyte** lithium ion **battery**)

L56 ANSWER 11 OF 15 HCA COPYRIGHT 2002 ACS

135:346863 **Cathode** active material for **nonaqueous electrolyte battery**. Li, Guohua; Yamada, Atsuo (Sony Corporation, Japan). Eur. Pat. Appl. EP 1150367 A2 20011031, 47 pp. DESIGNATED STATES: R: AT, BE, CH, DE, DK, ES, FR, GB, GR, IT, LI, LU, NL, SE, MC, PT, IE, SI, LT, LV, FI, RO. (English). CODEN: EPXXDW. APPLICATION: EP 2001-109945 20010424. PRIORITY: JP 2000-128999 20000425; JP 2000-129000 20000425.

AB A **pos. electrode** active material and a **nonaq. electrolyte cell** which uses the **pos. electrode** active material are disclosed. The cell has a high discharge voltage without lowering the capacity and superior charging/discharging characteristics. To this end, the **pos. electrode** active material contains a compd. represented by the general formula LixMnyFe1-yPO4, wherein 0 < .times. .ltoreq. 2 and 0.5 < y < 0.95, or a compd. represented by the general formula LixMnyA1-yPO4, where 0 < x .ltoreq. 2 and 0 < y < 1 and wherein A is a metal element selected from among Ti, Zn, Mg and Co or plural metal elements selected from among Ti, Fe, Zn, Mg and Co.

IT **371145-93-6**, Iron lithium manganese phosphate (Fe0.05-0.5Li0-2Mn0.5-0.95(PO4))
(**cathode** active material for **nonaq. electrolyte battery**)

RN 371145-93-6 HCA

CN Iron lithium manganese phosphate (Fe0.05-0.5Li0-2Mn0.5-0.95(PO4)) (9CI) (CA INDEX NAME)

Component	Ratio	Component Registry Number
O4P	1	14265-44-2
Mn	0.5 - 0.95	7439-96-5
Li	0 - 2	7439-93-2
Fe	0.05 - 0.5	7439-89-6

IC ICM H01M004-50
ICS H01M004-58
CC **52-2** (Electrochemical, Radiational, and Thermal Energy Technology)
ST **cathode** active material **nonaq** **electrolyte battery**
IT **Battery cathodes**
(**cathode** active material for **nonaq**. **electrolyte battery**)
IT Carbon black, uses
(**cathode** active material for **nonaq**. **electrolyte battery**)
IT Fluoropolymers, uses
(**cathode** active material for **nonaq**. **electrolyte battery**)
IT Secondary **batteries**
(lithium; **cathode** active material for **nonaq**. **electrolyte battery**)
IT 108-32-7, Propylene carbonate 616-38-6, Dimethylcarbonate 7429-90-5, Aluminum, uses 21324-40-3, Lithium hexafluorophosphate **371145-93-6**, Iron lithium manganese phosphate (Fe0.05-0.5Li0-2Mn0.5-0.95(PO4))
(**cathode** active material for **nonaq**. **electrolyte battery**)
IT 207462-44-0P 300858-61-1P 371145-94-7P 371145-95-8P 371145-97-0P 371145-99-2P 371146-01-9P 371146-06-4P 371146-11-1P
(**cathode** active material for **nonaq**. **electrolyte battery**)
IT 24937-79-9, Pvdf
(**cathode** active material for **nonaq**. **electrolyte battery**)

L56 ANSWER 12 OF 15 HCA COPYRIGHT 2002 ACS
135:259711 Reaction mechanism of the olivine-type Lix (Mn0.6Fe0.4)PO4 (0 .ltoreq. x .ltoreq. 1). Yamada, Atsuo; Kudo, Yoshihiro; Liu, Kuang-Yu (Technical Support Center, Frontier Science Laboratories, Yokohama, 240-0036, Japan). Journal of the Electrochemical Society, 148(7), A747-A754 (English) 2001. CODEN: JESOAN. ISSN: 0013-4651. Publisher: Electrochemical Society.
AB The charge-discharge reaction mechanism of the olivine-type

Lix(Mn0.6Fe0.4)PO4 (0 .ltoreq. x .ltoreq. 1.0), a possible 4 V class **cathode** material for lithium **batteries**, was investigated using equil. voltage measurements, X-ray diffraction, Moessbauer spectroscopy, and X-ray absorption spectroscopy. The flat two-phase region with an open-circuit voltage (OCV) of ca. 4.1 V (region I: 0 .ltoreq. x .ltoreq. 0.6, Mn3+/Mn2+) and the S-curved single-phase region with OCV .apprxeq. 3.5 V (region II: 0.6 .ltoreq. x .ltoreq. 1.0, Fe3+/Fe2+) were clearly identified together with the corresponding change in the unit cell dimensions of the orthorhombic lattice. These features show significant differences from the reaction mechanism of LixFePO4 (0 .ltoreq. x .ltoreq. 1), in which the whole Fe3+/Fe2+ reaction proceeds in a two-phase manner (LiFePO4-FePO4) with a flat voltage profile at 3.4 V.

IT **361393-19-3**, Iron lithium manganese phosphate (Fe0.4Li0-1Mn0.6(PO4))
(reaction mechanism of the olivine-type Lix (Mn0.6Fe0.4)PO4 (0 .ltoreq. x .ltoreq. 1) **cathode** material for lithium **batteries**)

RN 361393-19-3 HCA

CN Iron lithium manganese phosphate (Fe0.4Li0-1Mn0.6(PO4)) (9CI) (CA INDEX NAME)

Component	Ratio	Component Registry Number
O4P	1	14265-44-2
Mn	0.6	7439-96-5
Li	0 - 1	7439-93-2
Fe	0.4	7439-89-6

CC **52-2** (Electrochemical, Radiational, and Thermal Energy Technology)

ST lithium secondary **batteries** **cathode** iron lithium manganese phosphate

IT Secondary **batteries**
(lithium; reaction mechanism of the olivine-type Lix (Mn0.6Fe0.4)PO4 (0 .ltoreq. x .ltoreq. 1) **cathode** material for lithium **batteries**)

IT **Cathodes**
(reaction mechanism of the olivine-type Lix (Mn0.6Fe0.4)PO4 (0 .ltoreq. x .ltoreq. 1) **cathode** material for lithium **batteries**)

IT **361393-19-3**, Iron lithium manganese phosphate (Fe0.4Li0-1Mn0.6(PO4))
(reaction mechanism of the olivine-type Lix (Mn0.6Fe0.4)PO4 (0 .ltoreq. x .ltoreq. 1) **cathode** material for lithium **batteries**)

L56 ANSWER 13 OF 15 HCA COPYRIGHT 2002 ACS

130:170706 Lithium mixed oxide **cathode** active materials, **cathodes** using the materials, and lithium **batteries** using them. Amine, Khalil (Japan Storage Battery Co., Ltd., Japan).

Jpn. Kokai Tokkyo Koho JP 11025983 A2 19990129 Heisei, 22 pp. (Japanese). CODEN: JKXXAF. APPLICATION: JP 1997-215424 19970704.

AB The active materials comprise LiM11-xM2xPO4 (M1 = Co, Ni, Mn; M2 = Mg, Fe, Ni, Co, Mn, Zn, Ge, Cu, Cr; x = 0-0.5) having the olivine structure. The materials, which may have a rhombic structure, may be (1) LiMnPO4 with lattice parameters of a = 6.11 .+-. 0.50 .ANG., b = 10.46 .+-. 0.50 .ANG., and c = 4.73 .+-. 0.50 .ANG., (2) LiNiPO4 with lattice parameters of a = 5.86 .+-. 0.50 .ANG., b = 10.07 .+-. 0.20 .ANG., c = 4.68 .+-. 0.50 .ANG., or (3) LiCoPO4 having lattice parameters of a = 5.92 .+-. 0.50 .ANG., b = 10.21 .+-. 0.50 .ANG., and c = 4.70 .+-. 0.50 .ANG.. **Cathodes** using the materials and **batteries** using the **cathodes**, **electrolyte** solns., and anode active materials contg. Li, Li alloys, LixSnO2, and C materials are also claimed. Li **batteries** with high energy d. and high voltage are obtained.

IT **220334-05-4P**, Iron lithium manganese phosphate (Fe0-0.5LiMn0.5-1(PO4))
(Li mixed oxides of olivine structure as **cathode** active materials for high-energy-d. and high-voltage Li **batteries**)

RN 220334-05-4 HCA

CN Iron lithium manganese phosphate (Fe0-0.5LiMn0.5-1(PO4)) (9CI) (CA INDEX NAME)

Component	Ratio	Component Registry Number
O4P	1	14265-44-2
Mn	0.5 - 1	7439-96-5
Li	1	7439-93-2
Fe	0 - 0.5	7439-89-6

IC ICM H01M004-58
ICS C01B025-45; H01M004-02; H01M010-40

CC **52-2** (Electrochemical, Radiational, and Thermal Energy Technology)
Section cross-reference(s): 75

ST olivine lithium phosphorus oxide **cathode battery**

IT **Battery** anodes
Battery cathodes
Battery electrolytes
(Li mixed oxides of olivine structure as **cathode** active materials for high-energy-d. and high-voltage Li **batteries**)

IT Oxides (inorganic), uses
(Li mixed oxides of olivine structure as **cathode** active materials for high-energy-d. and high-voltage Li **batteries**)

IT Secondary **batteries**
(lithium; Li mixed oxides of olivine structure as **cathode** active materials for high-energy-d. and high-voltage Li **batteries**)

IT Crystal structure types
(rhombic; Li mixed oxides of olivine structure as **cathode** active materials for high-energy-d. and high-voltage Li **batteries**)
IT Lithium alloy
(anode; Li mixed oxides of olivine structure as **cathode** active materials for high-energy-d. and high-voltage Li **batteries**)
IT 13824-63-0P 13826-59-0P, Lithium manganese phosphate (LiMnPO4) 13977-83-8P, Lithium nickel phosphate (LiNiPO4) 220333-99-3P, Lithium magnesium manganese phosphate (LiMg0-0.5Mn0.5-1(PO4)) 220334-01-0P, Lithium manganese nickel phosphate (LiMn0.5-1Ni0-0.5(PO4)) 220334-04-3P, Cobalt lithium manganese phosphate (Co0-0.5LiMn0.5-1(PO4)) **220334-05-4P**, Iron lithium manganese phosphate (Fe0-0.5LiMn0.5-1(PO4)) 220334-06-5P, Lithium magnesium nickel phosphate (LiMg0-0.5Ni0.5-1(PO4)) 220334-07-6P, Lithium manganese nickel phosphate (LiMn0-0.5Ni0.5-1(PO4)) 220334-08-7P, Cobalt lithium nickel phosphate (Co0-0.5LiNi0.5-1(PO4)) 220334-09-8P, Iron lithium nickel phosphate (Fe0-0.5LiNi0.5-1(PO4))
(Li mixed oxides of olivine structure as **cathode** active materials for high-energy-d. and high-voltage Li **batteries**)
IT 7439-93-2, Lithium, uses 7440-44-0, Carbon, uses 160479-36-7, Lithium tin oxide
(anode; Li mixed oxides of olivine structure as **cathode** active materials for high-energy-d. and high-voltage Li **batteries**)
IT 21324-40-3, Lithium phosphorus fluoride (LiPF6)
(**electrolyte**; Li mixed oxides of olivine structure as **cathode** active materials for high-energy-d. and high-voltage Li **batteries**)
IT 7440-47-3, Chromium, uses 7440-50-8, Copper, uses 7440-56-4, Germanium, uses 7440-66-6, Zinc, uses
(mixed oxides contg.; Li mixed oxides of olivine structure as **cathode** active materials for high-energy-d. and high-voltage Li **batteries**)

L56 ANSWER 14 OF 15 HCA COPYRIGHT 2002 ACS
126:133614 The phosphate mineral association of the granitic pegmatites of the Fregeneda area (Salamanca, Spain). Roda, E.; Fontan, F.; Pesquera, A.; Velasco, F. (Dept. Mineralogia Petrologia, Univ. Paris Vasco/EHU, Bilbao, 48080, Spain). Mineralogical Magazine, 60(402), 767-778 (English) 1996. CODEN: MNLMBB. ISSN: 0026-461X. Publisher: Mineralogical Society.
AB In the Fregeneda area different pegmatitic types can be distinguished on the basis of their mineralogy, internal structure and field relationships. The most common type corresponds with simple pegmatites with a homogeneous internal structure, but Li and Sn-bearing pegmatites are also relatively widespread, besides a minority group of Fe-Mn phosphate-bearing pegmatites that has recently been characterized. These pegmatites are located in an

intermediate zone, between the barren pegmatites and the most evolved Li and Sn-bearing bodies, and they carry a complex assocn. of phosphate minerals. The study of these phosphates has allowed the identification of wyllieite, graftonite, sarcopside, triplite-zwieselite and ferrisicklerite as the primary phases. The secondary phosphates are rosemaryite, heterosite-purpurite, alluaudite and vayrynenite. The main characteristics of these phosphate minerals are reported, including their chem. compn., analyzed by electron microprobe, and their unit-cell parameters, calcd. using x-ray powder diffraction techniques. A common transformation mechanism in this phosphate assocn. is the oxidn. of the transition metal cations at the same time as Na-leaching in wyllieite to generate rosemaryite, and Li-leaching in ferrisicklerite to general heterosite. The occurrence of sarcopside lamellae in ferrisicklerite and heterosite is evidence of the replacement processes of the former by the latter. A Na-metasomatic replacement of the early phosphates as ferrisicklerite and graftonite, producing alluaudite, is also a well developed process. Phosphate minerals occur in pegmatites with an intermediate degree of fractionation, appearing between the barren and the more evolved pegmatites with Li and Sn, which is in agreement with the pegmatite field zonation established in the literature.

IT **12199-35-8**, Sicklerite
(compn. and petrog. features; primary and secondary phosphate minerals in the granitic pegmatites of the Fregeneda area, Spain)

RN 12199-35-8 HCA

CN Sicklerite (8CI, 9CI) (CA INDEX NAME)

Component	Ratio	Component Registry Number
O4P	1	14265-44-2
Mn	0.5 - 1	7439-96-5
Li	1	7439-93-2
Fe	0 - 0.5	7439-89-6

IT **12415-62-2**, Ferrisicklerite
(compn. and petrog. relations and unit-**cell** parameters; **primary** and secondary phosphate minerals in the granitic pegmatites of the Fregeneda area, Spain)

RN 12415-62-2 HCA

CN Ferrisicklerite (8CI, 9CI) (CA INDEX NAME)

Component	Ratio	Component Registry Number
O4P	1	14265-44-2
Mn	0 - 0.5	7439-96-5
Li	0 - 0.5	7439-93-2
Fe	0.5 - 1	7439-89-6

CC 53-1 (Mineralogical and Geological Chemistry)

IT Apatite-group minerals
(compn. and petrog. features and unit-**cell** parameters; **primary** and secondary phosphate minerals in the granitic pegmatites of the Fregeneda area, Spain)
IT 1306-05-4, Fluorapatite 12274-74-7, Sarcopside
(compn. and petrog. features and unit-**cell** parameters; **primary** and secondary phosphate minerals in the granitic pegmatites of the Fregeneda area, Spain)
IT 1302-58-5, Amblygonite **12199-35-8**, Sicklerite 12274-58-7, Graftonite 12274-72-5, Purpurite 12425-63-7, Vayrynenite 12426-14-1, Zwieselite 72276-47-2, Ferro-alluaudite 105016-17-9, Alluaudite 164034-63-3, Wyllieite 186361-98-8, Magnesian zwieselite 186362-02-7, Hagendorfite-Mn2+Na 186362-03-8, Wyllieite-Mn2+Na
(compn. and petrog. features; primary and secondary phosphate minerals in the granitic pegmatites of the Fregeneda area, Spain)
IT **12415-62-2**, Ferrisicklerite
(compn. and petrog. relations and unit-**cell** parameters; **primary** and secondary phosphate minerals in the granitic pegmatites of the Fregeneda area, Spain)

L56 ANSWER 15 OF 15 HCA COPYRIGHT 2002 ACS
68:91198 Magnetic susceptibility of 34 manganese-bearing minerals. Powell, Howard E.; Ballard, Lee N. (Rolla Met. Res. Center, Bur. of Mines, Rolla, Mo., USA). Inf. Circ. - U. S., Bur. Mines, No. 8359, 10 pp. (English) 1968. CODEN: XIMIAL.
AB All susceptibilities were detd. by the Faraday method using a Varian V-4004, 4-in. electromagnet. The source of each sample and petrographic, spectrographic, and chem. analyses are given. Values ranged from 22.8 .times. 10-6 c.g.s. units for a sample of coronadite (MnPbMn6O14) to 824 .times. 10-6 for a sample of franklinite (Mn0.18Zn0.82)O.Fe2O3. Detns. were made at 20-3.degree. on -270-mesh samples at a flux d. of 20,000 gauss.
IT **12199-35-8 17548-96-8**
(magnetic susceptibility of)
RN 12199-35-8 HCA
CN Sicklerite (8CI, 9CI) (CA INDEX NAME)

Component	Ratio	Component Registry Number
O4P	1	14265-44-2
Mn	0.5 - 1	7439-96-5
Li	1	7439-93-2
Fe	0 - 0.5	7439-89-6

RN 17548-96-8 HCA
CN Lithiophilite, ferroan (8CI, 9CI) (CA INDEX NAME)

Component	Ratio	Component Registry Number

O4P	1	14265-44-2
Mn	0.5 - 0.9	7439-96-5
Li	1	7439-93-2
Fe	0.1 - 0.5	7439-89-6

CC **72** (Magnetic Phenomena)
IT 1309-54-2 1309-55-3 1310-98-1 1313-12-8 1317-55-1
1318-06-5 1332-08-7 12025-98-8 12032-72-3 12033-13-5
12172-90-6 12173-49-8 12174-34-4 **12199-35-8**
12199-51-8 12209-34-6 12260-01-4 12274-64-5 12274-78-1
12426-56-1 14567-57-8 14854-26-3 17499-18-2 **17548-96-8**
18972-84-4 18972-86-6 18972-96-8
(magnetic susceptibility of)

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L57 ANSWER 1 OF 9 HCA COPYRIGHT 2002 ACS
137:203995 Method of preparation and **battery** use of lithium based phosphates. Barker, Jeremy; Saidi, M. Yazid (Valence Technology, Inc., USA). U.S. US 6447951 B1 20020910, 25 pp., Cont.-in-part of U.S. 5,871,866. (English). CODEN: USXXAM. APPLICATION: US 1998-195961 19981119. PRIORITY: US 1996-717919 19960923.
AB A lithium ion **battery** comprises: a first electrode having an active material in a first condition of the nominal general formula Li3-xM'yM''2-y(PO4)3, x = 0, 0<y<2 and in a second condition of the nominal general formula: Li3-xM'yM''2-y(PO4)3, 0<x.ltoreq.3, wherein M' is Zr or Ti and M'' is a metal selected from V, Cr, Mn, Fe, Co, Ni, Cu, Sn, Pb, Mo, W, Cd, Zn, and Pd, with the proviso that when M' is Ti, M'' is not Fe; a second electrode which is a counter-electrode to the first electrode; and an **electrolyte** between the electrodes.
IT **204653-30-5P**, Lithium vanadium phosphate Li3V2(PO4)3
(method of prepn. and **battery** use of lithium based phosphates)
RN 204653-30-5 HCA
CN Lithium vanadium phosphate (Li3V2(PO4)3) (9CI) (CA INDEX NAME)

Component	Ratio	Component Registry Number
O4P	3	14265-44-2
V	2	7440-62-2
Li	3	7439-93-2

IC ICM H01M004-58
NCL 429218100
CC 52-2 (Electrochemical, Radiational, and Thermal Energy Technology)
Section cross-reference(s): 49
ST **battery** electrode lithium metal phosphorous compd
IT Secondary **batteries**

(lithium; method of prepn. and **battery** use of lithium based phosphates)

IT **Battery cathodes**
(method of prepn. and **battery** use of lithium based phosphates)

IT 7439-93-2, Lithium, uses 7440-44-0, Carbon, uses 7782-42-5, Graphite, uses
(method of prepn. and **battery** use of lithium based phosphates)

IT **204653-30-5P**, Lithium vanadium phosphate Li3V2(PO4)3
204653-32-7P, Aluminum lithium vanadium phosphate AlLi3V(PO4)3
270258-22-5P, Lithium manganese zirconium phosphate Li3MnZr(PO4)3
(method of prepn. and **battery** use of lithium based phosphates)

L57 ANSWER 2 OF 9 HCA COPYRIGHT 2002 ACS

136:282003 Lithium-based **cathode** active materials for rechargeable lithium **battery** and preparation thereof. Barker, Jeremy; Saidi, M. Yazid; Swoyer, Jeffrey L. (UK). U.S. Pat. Appl. Publ. US 20020039687 A1 20020404, 39 pp., Cont.-in-part of U. S. Ser. No. 484,799. (English). CODEN: USXXCO. APPLICATION: US 2001-908480 20010718. PRIORITY: US 2000-484799 20000118; WO 2000-US35302 20001222.

AB The invention provides novel lithium-mixed metal materials which, upon electrochem. interaction, release lithium ions, and are capable of reversibly cycling lithium ions. The invention provides a rechargeable lithium **battery** which comprises an electrode formed from the novel lithium-mixed metal materials. Methods for making the novel lithium-mixed metal materials and methods for using such lithium-mixed metal materials in **electrochem. cells** are also provided. The lithium-mixed metal materials comprise lithium and at least one other metal besides lithium. Preferred materials are lithium-mixed metal phosphates which contain lithium and two other metals besides lithium.

IT **204653-30-5P**, Lithium vanadium phosphate Li3V2(PO4)3
(lithium-based **cathode** active materials for rechargeable lithium **battery** and prepn. thereof)

RN 204653-30-5 HCA

CN Lithium vanadium phosphate (Li3V2(PO4)3) (9CI) (CA INDEX NAME)

Component	Ratio	Component Registry Number
O4P	3	14265-44-2
V	2	7440-62-2
Li	3	7439-93-2

IC ICM H01M004-58
ICS C01B025-45

NCL 429231950

CC 52-2 (Electrochemical, Radiational, and Thermal Energy Technology)

ST **battery cathode** lithium based active material

IT **Battery cathodes**
(lithium-based **cathode** active materials for rechargeable lithium **battery** and prepn. thereof)

IT Olivine-group minerals
(lithium-based **cathode** active materials for rechargeable lithium **battery** and prepn. thereof)

IT Secondary **batteries**
(lithium; lithium-based **cathode** active materials for rechargeable lithium **battery** and prepn. thereof)

IT 405914-52-5, Cobalt lithium magnesium phosphate ((Co,Mg)Li(PO4)) 405914-53-6, Cobalt lithium magnesium phosphate (Co0.9LiMg0.1(PO4)) 405914-58-1, Cobalt lithium magnesium phosphate (Co0.95LiMg0.05(PO4)) 405914-63-8 405914-68-3, Calcium cobalt lithium phosphate ((Ca,Co)Li(PO4)) 405914-73-0, Calcium cobalt lithium phosphate (Ca0.1Co0.9Li(PO4)) 405914-83-2, Cobalt lithium zinc phosphate ((Co,Zn)Li(PO4)) 405914-88-7, Cobalt lithium zinc phosphate (Co0.9LiZn0.1(PO4)) 405914-93-4, Cobalt lithium strontium phosphate ((Co,Sr)Li(PO4)) 405914-98-9, Cobalt lead lithium phosphate ((Co,Pb)Li(PO4)) 405915-04-0, Cadmium cobalt lithium phosphate ((Cd,Co)Li(PO4)) 405915-09-5, Cobalt lithium tin phosphate ((Co,Sn)Li(PO4)) 405915-14-2, Barium cobalt lithium phosphate ((Ba,Co)Li(PO4)) 405915-21-1, Beryllium cobalt lithium phosphate ((Be,Co)Li(PO4)) 405915-29-9, Cobalt lithium magnesium phosphate (Co0.5-1LiMg0-0.5(PO4)) 405915-34-6, Cobalt lithium magnesium phosphate (Co0.8-1LiMg0-0.2(PO4)) 405915-39-1, Calcium cobalt lithium phosphate (Ca0-0.5Co0.5-1Li(PO4)) 405915-44-8, Calcium cobalt lithium phosphate (Ca0-0.2Co0.8-1Li(PO4)) 405915-48-2, Cobalt lithium zinc phosphate (Co0.5-1LiZn0-0.5(PO4)) 405915-51-7, Cobalt lithium zinc phosphate (Co0.8-1LiZn0-0.2(PO4)) 405915-56-2, Cobalt lithium strontium phosphate (Co0.5-1LiSr0-0.5(PO4)) 405915-59-5, Cobalt lithium strontium phosphate (Co0.8-1LiSr0-0.2(PO4)) 405915-63-1, Cobalt lead lithium phosphate (Co0.5-1Pb0-0.5Li(PO4)) 405915-66-4, Cobalt lead lithium phosphate (Co0.8-1Pb0-0.2Li(PO4)) 405915-69-7, Cadmium cobalt lithium phosphate (Cd0-0.5Co0.5-1Li(PO4)) 405915-79-9, Cadmium cobalt lithium phosphate (Cd0-0.2Co0.8-1Li(PO4)) 405915-82-4, Cobalt lithium tin phosphate (Co0.8-1LiSn0-0.2(PO4)) 405915-85-7, Cobalt lithium tin phosphate (Co0.95-1LiSn0-0.05(PO4)) 405915-88-0, Cobalt lithium tin phosphate (Co0.5-1LiSn0-0.5(PO4)) 405915-90-4, Barium cobalt lithium phosphate (Ba0-0.5Co0.5-1Li(PO4)) 405915-92-6, Barium cobalt lithium phosphate (Ba0-0.2Co0.8-1Li(PO4)) 405915-94-8, Beryllium cobalt lithium phosphate (Be0-0.5Co0.5-1Li(PO4)) 405915-96-0, Beryllium cobalt lithium phosphate (Be0-0.2Co0.8-1Li(PO4))
(lithium-based **cathode** active materials for rechargeable lithium **battery** and prepn. thereof)

IT **204653-30-5P**, Lithium vanadium phosphate Li3V2(PO4)3 349632-76-4P, Iron lithium magnesium phosphate (Fe0.9LiMg0.1(PO4)) 349632-79-7P, Calcium iron lithium phosphate (Ca0.1Fe0.9Li(PO4)) 349632-82-2P, Iron lithium zinc phosphate (Fe0.9LiZn0.1(PO4))
(lithium-based **cathode** active materials for rechargeable lithium **battery** and prepn. thereof)

L57 ANSWER 3 OF 9 HCA COPYRIGHT 2002 ACS
135:109741 Preparation of lithium-based electrochemically active materials for lithium **batteries**. Barker, Jeremy; Saidi, M. Yazid (Valence Technology, Inc., USA). PCT Int. Appl. WO 2001054212 A1 20010726, 97 pp. DESIGNATED STATES: W: AE, AG, AL, AM, AT, AU, AZ, BA, BB, BG, BR, BY, BZ, CA, CH, CN, CR, CU, CZ, DE, DK, DM, DZ, EE, ES, FI, GB, GD, GE, GH, GM, HR, HU, ID, IL, IN, IS, JP, KE, KG, KP, KR, KZ, LC, LK, LR, LS, LT, LU, LV, MA, MD, MG, MK, MN, MW, MX, MZ, NO, NZ, PL, PT, RO, RU, SD, SE, SG, SI, SK, SL, TJ, TM, TR, TT, TZ, UA, UG, US, UZ, VN, YU, ZA, ZW, AM, AZ, BY, KG, KZ, MD, RU, TJ, TM; RW: AT, BE, BF, BJ, CF, CG, CH, CI, CM, CY, DE, DK, ES, FI, FR, GA, GB, GR, IE, IT, LU, MC, ML, MR, NE, NL, PT, SE, SN, TD, TG, TR. (English). CODEN: PIXXD2. APPLICATION: WO 2000-US35302 20001222. PRIORITY: US 2000-484799 20000118.

AB The invention provides novel lithium-mixed metal materials which, upon electrochem. interaction, release lithium ions, and are capable of reversibly cycling lithium ions. The invention provides a rechargeable lithium **battery** which comprises an electrode formed from the novel lithium-mixed metal materials. Methods for making the novel lithium-mixed metal materials and methods for using such lithium-mixed metal materials in **electrochem. cells** are also provided. The lithium-mixed metal materials comprise lithium and at least one other metal besides lithium. Preferred materials are lithium-mixed metal phosphates which contain lithium and two other metals besides lithium.

IT **204653-30-5P**, Lithium vanadium phosphate Li3V2(PO4)3
(prepn. of lithium-based electrochem. active materials for lithium **batteries**)

RN 204653-30-5 HCA

CN Lithium vanadium phosphate (Li3V2(PO4)3) (9CI) (CA INDEX NAME)

Component	Ratio	Component Registry Number
O4P	3	14265-44-2
V	2	7440-62-2
Li	3	7439-93-2

IC ICM H01M004-48
ICS H01M010-40

CC 52-2 (Electrochemical, Radiational, and Thermal Energy Technology)
Section cross-reference(s): 49

ST **battery cathode** lithium mixed metal phosphate

IT Secondary **batteries**
(lithium; prepn. of lithium-based electrochem. active materials for lithium **batteries**)

IT **Battery cathodes**
(prepn. of lithium-based electrochem. active materials for lithium **batteries**)

IT Carbon black, uses
(prepn. of lithium-based electrochem. active materials for

lithium **batteries**)

IT EPDM rubber
(prepn. of lithium-based electrochem. active materials for lithium **batteries**)

IT 96-49-1, Ethylene carbonate 616-38-6, Dimethyl carbonate 7439-93-2, Lithium, uses 12162-92-4, lithium vanadium oxide liv2o5 21324-40-3, Lithium hexafluorophosphate
(prepn. of lithium-based electrochem. active materials for lithium **batteries**)

IT 331622-65-2P, Iron lithium zinc phosphate (Fe0.8LiZn0.2(PO4)) 349632-76-4P, Iron lithium magnesium phosphate (Fe0.9LiMg0.1(PO4)) 349632-79-7P, Calcium iron lithium phosphate (Ca0.1Fe0.9Li(PO4)) 349632-82-2P, Iron lithium zinc phosphate (Fe0.9LiZn0.1(PO4)) 349632-85-5P 349632-88-8P
(prepn. of lithium-based electrochem. active materials for lithium **batteries**)

IT 554-13-2, Lithium carbonate 1305-62-0, Calcium hydroxide, reactions 1309-37-1, Ferric oxide, reactions 1309-42-8, Magnesium hydroxide 7440-44-0, Carbon, reactions 7779-90-0, Zinc phosphate 7783-28-0, Diammonium hydrogen phosphate 10045-86-0, iron phosphate fepo4 13453-80-0, Lithium dihydrogen phosphate 14940-41-1, Iron phosphate fe3(po4)2
(prepn. of lithium-based electrochem. active materials for lithium **batteries**)

IT 15365-14-7P, iron lithium phosphate felipo4 **204653-30-5P**, Lithium vanadium phosphate Li3V2(PO4)3
(prepn. of lithium-based electrochem. active materials for lithium **batteries**)

L57 ANSWER 4 OF 9 HCA COPYRIGHT 2002 ACS

134:149942 Enhancement of discharge capacity of Li3V2(PO4)3 by stabilizing the orthorhombic phase at room temperature. Sato, Mineo; Ohkawa, Hirokazu; Yoshida, Kenji; Saito, Mai; Uematsu, Kazuyoshi; Toda, Kenji (Department of Chemistry and Chemical Engineering, Faculty of Engineering, Niigata University, Niigata, 950-2181, Japan). Solid State Ionics, 135(1-4), 137-142 (English) 2000. CODEN: SSIOD3. ISSN: 0167-2738. Publisher: Elsevier Science B.V..

AB Li3V2(PO4)3 and solid solns. of Li3-2x(V1-xZrx)2(PO4) 3 were prepd. by a solid state reaction. A high temp. orthorhombic phase of Li3V2(PO4)3 with a .beta.-Fe2(SO4)3-type was successfully stabilized at room temp. by substituting Zr for V with substitution ratios beyond x=0.05. The pure material of Li3V2(PO4)3 exhibited a **cathode** performance with two well defined regions of plateau at around 3.7 and 4.1 V vs. Li/Li+ upon charging and 3.6 and 4.0 V vs. Li/Li+ upon discharging, resp., suggesting two types of phases produced upon the charge/discharge process. On the other hand, the **cathode** performance of the orthorhombic stabilized materials showed almost the same charge/discharge voltages as those of the pure material, but, with two plateaus slightly sloping, showed a considerably improved charge/discharge cycle performance compared to that of the pure material. Such improvement on the charge/discharge

cycle performance is suggested to come from the disordered lithium ion arrangement in the orthorhombic phase.

IT **204653-30-5**, Lithium vanadium phosphate(Li3V2(PO4)3)
(enhancement of discharge capacity of Li3V2(PO4)3 by stabilizing the orthorhombic phase at room temp.)

RN 204653-30-5 HCA

CN Lithium vanadium phosphate (Li3V2(PO4)3) (9CI) (CA INDEX NAME)

Component	Ratio	Component Registry Number
O4P	3	14265-44-2
V	2	7440-62-2
Li	3	7439-93-2

CC 52-2 (Electrochemical, Radiational, and Thermal Energy Technology)

ST **battery cathode** lithium vanadium zirconium phosphate

IT **Battery cathodes**
(enhancement of discharge capacity of Li3V2(PO4)3 by stabilizing the orthorhombic phase at room temp.)

IT Secondary **batteries**
(lithium; enhancement of discharge capacity of Li3V2(PO4)3 by stabilizing the orthorhombic phase at room temp.)

IT **204653-30-5**, Lithium vanadium phosphate(Li3V2(PO4)3)
323204-07-5, Lithium vanadium zirconium phosphate (Li2.8V1.8Zr0.2(PO4)3) 323204-08-6, Lithium vanadium zirconium phosphate (Li2.6V1.6Zr0.4(PO4)3)
(enhancement of discharge capacity of Li3V2(PO4)3 by stabilizing the orthorhombic phase at room temp.)

L57 ANSWER 5 OF 9 HCA COPYRIGHT 2002 ACS

134:59010 Rhombohedral Form of Li3V2(PO4)3 as a **Cathode** in Li-Ion **Batteries**. Gaubicher, J.; Wurm, C.; Goward, G.; Masquelier, C.; Nazar, L. (Department of Chemistry, University of Waterloo, Waterloo, ON, N2L 3G1, Can.). Chemistry of Materials, 12(11), 3240-3242 (English) 2000. CODEN: CMATEX. ISSN: 0897-4756. Publisher: American Chemical Society.

AB We report on the first prepn. of rhombohedral B-Li3V2(PO4)3 by ion exchange from Na3V2(PO4)3 and on the first investigation of its electrochem. behavior upon Li extn., coupled with ex-situ x ray diffraction and solid state 7Li NMR studies. Electrochem. oxidn. of B-Li3V2(PO4)3 under slow potentiodynamic conditions (10 mV/1.5 h) up to 4.1 V followed by equilibration shows that almost 2 Li can be extd. from the framework. The charge-discharge profile of B-Li3V2(PO4)3 under galvanostatic control confirms that 2 alkali cations/electrons can be extd. under these conditions, which minimize possible parasitic **electrolyte** oxidn.

IT **204653-30-5P**, Lithium vanadium phosphate Li3V2(PO4)3
(rhombohedral form of Li3V2(PO4)3 as **cathode** in Li-ion **batteries**)

RN 204653-30-5 HCA

CN Lithium vanadium phosphate (Li3V2(PO4)3) (9CI) (CA INDEX NAME)

Component	Ratio	Component Registry Number
O4P	3	14265-44-2
V	2	7440-62-2
Li	3	7439-93-2

CC 52-2 (Electrochemical, Radiational, and Thermal Energy Technology)
ST **battery cathode** lithium vanadium phosphate
IT Secondary **batteries**
(lithium; rhombohedral form of Li3V2(PO4)3 as **cathode** in Li-ion **batteries**)
IT **Battery cathodes**
(rhombohedral form of Li3V2(PO4)3 as a **cathode** in Li-ion **batteries**)
IT Ion exchange
(rhombohedral form of Li3V2(PO4)3 as **cathode** in Li-ion **batteries**)
IT **204653-30-5P**, Lithium vanadium phosphate Li3V2(PO4)3
(rhombohedral form of Li3V2(PO4)3 as **cathode** in Li-ion **batteries**)
IT 7440-42-8, Boron, uses
(rhombohedral form of Li3V2(PO4)3 as **cathode** in Li-ion **batteries**)
IT 69104-84-3
(rhombohedral form of Li3V2(PO4)3 as **cathode** in Li-ion **batteries**)

L57 ANSWER 6 OF 9 HCA COPYRIGHT 2002 ACS
133:7071 Lithium based phosphates for use in lithium ion **batteries** and method of preparation. Barker, Jeremy; Saidi, M. Yazid (Valence Technology, Inc., USA). PCT Int. Appl. WO 2000031812 A1 20000602, 69 pp. DESIGNATED STATES: W: AL, AM, AT, AU, AZ, BA, BB, BG, BR, BY, CA, CH, CN, CU, CZ, DE, DK, EE, ES, FI, GB, GE, GH, HU, IL, IS, JP, KE, KG, KP, KR, KZ, LC, LK, LR, LS, LT, LU, LV, MD, MG, MK, MN, MW, MX, NO, NZ, PL, PT, RO, RU, SD, SE, SG, SI, SK, SL, TJ, TM, TR, TT, UA, UG, US, UZ, VN, YU, ZW, AM, AZ, BY, KG, KZ, MD, RU, TJ, TM; RW: AT, BE, BF, BJ, CF, CG, CH, CI, CM, CY, DE, DK, ES, FI, FR, GA, GB, GR, IE, IT, LU, MC, ML, MR, NE, NL, PT, SE, SN, TD, TG. (English). CODEN: PIXXD2. APPLICATION: WO 1999-US23074 19991005. PRIORITY: US 1998-195961 19981119.
AB A Li ion **battery** comprises a first electrode having an active material in a first condition of the nominal general formula Li3-xM'yM''2-y(PO4)3, x = 0, y 0-2, and in a second condition of the nominal general formula Li3-xM'yM''2-y(PO4)3, x = 0-3; M'' is a transition metal and M' is a nontransition metal selected from the group consisting of metals and metalloids; a second electrode which is a counter electrode to the first electrode; and an **electrolyte** between the electrodes.
IT **204653-30-5**, Lithium vanadium phosphate Li3V2(PO4)3

(lithium based phosphates for use in lithium ion **batteries** and method of prepn.)

RN 204653-30-5 HCA
CN Lithium vanadium phosphate (Li3V2(PO4)3) (9CI) (CA INDEX NAME)

Component	Ratio	Component Registry Number
O4P	3	14265-44-2
V	2	7440-62-2
Li	3	7439-93-2

IC ICM H01M004-58
ICS H01M010-40; C01B025-45
CC 52-2 (Electrochemical, Radiational, and Thermal Energy Technology)
ST lithium **battery cathode** lithium based phosphate
IT **Battery cathodes**
(lithium based phosphates for use in lithium ion **batteries** and method of prepn.)
IT Carbonaceous materials (technological products)
(lithium based phosphates for use in lithium ion **batteries** and method of prepn.)
IT Secondary **batteries**
(lithium; lithium based phosphates for use in lithium ion **batteries** and method of prepn.)
IT 96-49-1, Ethylene carbonate 616-38-6, Dimethyl carbonate 7782-42-5, Graphite, uses 21324-40-3, Lithium hexafluorophosphate **204653-30-5**, Lithium vanadium phosphate Li3V2(PO4)3 204653-32-7, Aluminum lithiumvanadium phosphate AlLi3V(PO4)3 270258-22-5
(lithium based phosphates for use in lithium ion **batteries** and method of prepn.)
IT 554-13-2, Lithium carbonate 1314-23-4, Zirconia, reactions 1314-62-1, Vanadium pentoxide, reactions 1333-74-0, Hydrogen, reactions 1344-43-0, Manganese oxide mno, reactions 7722-76-1, Ammonium phosphate NH4H2PO4 7783-28-0 21645-51-2, Aluminum hydroxide, reactions
(lithium based phosphates for use in lithium ion **batteries** and method of prepn.)
IT 7440-44-0, Carbon, uses
(mesocarbon microbeads; lithium based phosphates for use in lithium ion **batteries** and method of prepn.)

L57 ANSWER 7 OF 9 HCA COPYRIGHT 2002 ACS
130:314438 Lithium copper phosphorus oxide active materials for **batteries**, **battery cathodes**, and **batteries**. Amin, Carell (Japan Storage Battery Co., Ltd., Japan). Jpn. Kokai Tokkyo Koho JP 11111295 A2 19990423 Heisei, 24 pp. (Japanese). CODEN: JKXXAF. APPLICATION: JP 1997-307817 19971003.
AB (Active material for **batteries** having compn. formula LiCu1+xPO4 (x = 0-1) is claimed.) The active materials are manufd.

by mixing Li2CO3, CuO, and (NH4)2HPO4 in a stoichiometric ratio, forming into pellets under 400 kg/cm2 pressure, and 2-step heating 1st at 450.degree. and then at 800.degree.. Also claimed are Li **battery cathodes** comprising the active material, and **batteries** comprising the active material **cathodes**, **electrolytes**, and anodes comprising Li (alloys), LixSnO2, C, and/or graphite. The **batteries** have high capacity.

IT **223571-65-1P**, Copper lithium phosphate (Cu0.5-1Li(PO4))
(anode; lithium copper phosphorus oxide **cathode** active materials for lithium secondary **batteries**)

RN 223571-65-1 HCA

CN Copper lithium phosphate (Cu0.5-1Li(PO4)) (9CI) (CA INDEX NAME)

Component	Ratio	Component Registry Number
O4P	1	14265-44-2
Cu	0.5 - 1	7440-50-8
Li	1	7439-93-2

IT **223571-66-2P**, Copper lithium phosphate (Cu1.5-2Li(PO4))
(lithium copper phosphorus oxide **cathode** active materials for lithium secondary **batteries**)

RN 223571-66-2 HCA

CN Copper lithium phosphate (Cu1.5-2Li(PO4)) (9CI) (CA INDEX NAME)

Component	Ratio	Component Registry Number
O4P	1	14265-44-2
Cu	1.5 - 2	7440-50-8
Li	1	7439-93-2

IC ICM H01M004-58
ICS H01M004-02; H01M010-40

CC 52-2 (Electrochemical, Radiational, and Thermal Energy Technology)

ST lithium copper phosphorus oxide active material; secondary **battery** oxide **cathode** active material

IT **Battery cathodes**
Secondary **batteries**
(lithium copper phosphorus oxide **cathode** active materials for lithium secondary **batteries**)

IT Lithium alloy
(anodes; lithium copper phosphorus oxide **cathode** active materials for lithium secondary **batteries**)

IT **223571-65-1P**, Copper lithium phosphate (Cu0.5-1Li(PO4))
(anode; lithium copper phosphorus oxide **cathode** active materials for lithium secondary **batteries**)

IT 7439-93-2, Lithium, uses 7440-44-0, Carbon, uses 7782-42-5, Graphite, uses 160479-36-7, Lithium tin oxide
(anodes; lithium copper phosphorus oxide **cathode** active

materials for lithium secondary **batteries**)

IT 554-13-2, Lithium carbonate 1317-38-0, Copper monoxide, processes 7783-28-0, Diammonium hydrogenphosphate
(**cathode** active materials from; lithium copper phosphorus oxide **cathode** active materials for lithium secondary **batteries**)

IT **223571-66-2P**, Copper lithium phosphate (Cu1.5-2Li(PO4))
(lithium copper phosphorus oxide **cathode** active materials for lithium secondary **batteries**)

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129:191547 **Nonaqueous-electrolyte** lithium secondary **battery** having high discharge capacity. Nagata, Mikito; Karril, Amin; Tsukamoto, Kotobuki (Japan Storage Battery Co., Ltd., Japan). Jpn. Kokai Tokkyo Koho JP 10208730 A2 19980807 Heisei, 5 pp. (Japanese). CODEN: JKXXAF. APPLICATION: JP 1997-25985 19970124.

AB In the title **battery**, **cathode** contains a Li-contg. metal oxide as an active mass and another substance having Li+-discharging potential higher than that of the metal oxide and of amt. corresponding to an amt. of Li+ consumed in the initial charging. Preferably, the substance is selected from Li1+xMn2O4 (X = 0-1), Li2NiO2, LiMnO2, Li2Mn2-xMxO4 (M = Co, Ni, Zn, Mg, Fe; X = 0-2), Li2Mn1.5Ni0.5O4, LixVO3 (X = 1-6), Li3Fe2(PO4)3, Li3Fe2(SO4)3, Li3FeV(PO4)3, and Li3V(PO4)3. Anode in the **battery** may be selected from graphite, coke, (amorphous) carbon, SnO, SnO2, Sn1-xMxO (M = Hg, P, B, Si, Ge Sb; 0 .ltoreq. X < 1), Sn1-xMxO2 (M = Hg, P, B, Si, Ge, Sb; 0 .ltoreq. X < 1), Sn3O2(OH)2, Sn3-xMxO2(OH)2 (M = Mg, P, B, Si, Ge, Sb, As, Mn; 0 .ltoreq. X < 3), LiSiO2, SiO2, and LiSnO2. Lack of Li+ consumed in formation of a surficial film on the anode and Li+ trapped in the anode both occurring in the initial charging is supplemented by the substance.

IT **211753-59-2**, Lithium vanadium phosphate (Li3V(PO4)3)
(lithium ion supplier in **cathode**; Li secondary **batteries** with **cathodes** contg. Li metal oxide and Li+ supplier additives)

RN 211753-59-2 HCA

CN Lithium vanadium phosphate (Li3V(PO4)3) (9CI) (CA INDEX NAME)

Component	Ratio	Component Registry Number
O4P	3	14265-44-2
V	1	7440-62-2
Li	3	7439-93-2

IC ICM H01M004-02
ICS H01M004-58; H01M010-40

CC 52-2 (Electrochemical, Radiational, and Thermal Energy Technology)

ST lithium **battery cathode** lithium ion supplier; anode oxide lithium **battery**; tin oxide anode lithium **battery**; coke anode lithium **battery**; silica anode

lithium **battery**

IT **Battery cathodes**
(Li secondary **batteries** with **cathodes** contg. Li metal oxide and Li+ supplier additives)

IT Coke
(anode; Li secondary **batteries** with **cathodes** contg. Li metal oxide and Li+ supplier additives)

IT **Battery** anodes
(oxide; Li secondary **batteries** with **cathodes** contg. Li metal oxide and Li+ supplier additives)

IT 7440-44-0, Carbon, uses 7631-86-9, Silica, uses 7782-42-5, Graphite, uses 18282-10-5, Tin oxide (SnO2) 21651-19-4, Tin oxide (SnO) 39432-42-3, Tin hydroxide oxide Sn3(OH)2O2 186448-61-3, Lithium oxide silicide (Li2OSi) 211753-60-5, Lithium tin oxide (LiSnO2)
(anode; Li secondary **batteries** with **cathodes** contg. Li metal oxide and Li+ supplier additives)

IT 12057-17-9, Lithium manganese oxide (LiMn2O4) 12162-79-7, Lithium manganese oxide (LiMnO2) 12325-84-7, Lithium nickel oxide (Li2NiO2) 36058-25-0, Lithium iron phosphate [Li3Fe2(PO4)3] 123550-86-7, Lithium manganese oxide (Li0.5-1MnO2) 186131-68-0, Iron lithium vanadium phosphate (FeLi3V(PO4)3) 200938-46-1, Lithium manganese nickel oxide (Li2Mn1.5Ni0.5O4) 211753-57-0, Lithium vanadium oxide (Li1-6VO3) 211753-58-1, Iron lithium sulfate (Fe2Li3(SO4)3) **211753-59-2**, Lithium vanadium phosphate (Li3V(PO4)3)
(lithium ion supplier in **cathode**; Li secondary **batteries** with **cathodes** contg. Li metal oxide and Li+ supplier additives)

L57 ANSWER 9 OF 9 HCA COPYRIGHT 2002 ACS

128:232794 Lithium-containing, lithium-intercalating phosphates and their use as electrode material in secondary lithium-ion **battery**. Barker, Jeremy; Saidi, Mohamed-Yazid (Valence Technology, Inc., USA; Barker, Jeremy; Saidi, Mohamed-Yazid). PCT Int. Appl. WO 9812761 A1 19980326, 42 pp. DESIGNATED STATES: W: AL, AM, AT, AU, AZ, BA, BB, BG, BR, BY, CA, CH, CN, CU, CZ, DE, DK, EE, ES, FI, GB, GE, GH, HU, IL, IS, JP, KE, KG, KP, KR, KZ, LC, LK, LR, LS, LT, LU, LV, MD, MG, MK, MN, MW, MX, NO, NZ, PL, PT, RO, RU, SD, SE, SG, SI, SK, SL, TJ, TM, TR, TT, UA, UG, US, UZ, VN, YU, ZW, AM, AZ, BY, KG, KZ, MD, RU, TJ, TM; RW: AT, BE, BF, BJ, CF, CG, CH, CI, CM, DE, DK, ES, FI, FR, GA, GB, GR, IE, IT, LU, MC, ML, MR, NE, NL, PT, SE, SN, TD, TG. (English). CODEN: PIXXD2. APPLICATION: WO 1997-US15544 19970904. PRIORITY: US 1996-717979 19960923.

AB The phosphates comprise Li(3-x)MM'(PO4)3, where in the 1st condition x = 0, at least 1 of M and M' is a metal, and M and M' are the same or different from one another; and in the 2nd condition 0 <x .ltoreq.3 and at least 1 of M and M' has an oxidn. state higher than its oxidn. state in the 1st condition P compd. One of M and M' is selected from Mg, Ca, Cu, Co, Fe, Ni, Mo, V, Cr, Mn, and Ti. The phosphates comprise Li3V2(PO4)3, Li3VTi(PO4)3, Li3Fe2(PO4)3, and Li3FeV(PO4)3.

IT **204653-30-5P**, Lithium vanadium phosphate (Li3V2(PO4)3)
(**cathode** material for secondary lithium-ion **battery**)
RN 204653-30-5 HCA
CN Lithium vanadium phosphate (Li3V2(PO4)3) (9CI) (CA INDEX NAME)

Component	Ratio	Component Registry Number
O4P	3	14265-44-2
V	2	7440-62-2
Li	3	7439-93-2

IC ICM H01M004-58
ICS H01M004-52; H01M010-40
CC 52-2 (Electrochemical, Radiational, and Thermal Energy Technology)
ST lithium intercalating phosphate **battery** electrode; vanadium lithium phosphate **battery** electrode; titanium vanadium lithium phosphate **battery** electrode; iron lithium phosphate **battery** electrode
IT **Battery** electrodes
(lithium-intercalating phosphates)
IT **204653-30-5P**, Lithium vanadium phosphate (Li3V2(PO4)3)
(**cathode** material for secondary lithium-ion **battery**)
IT 36058-25-0, Iron lithium phosphate (Fe2Li3(PO4)3) 186131-68-0, Iron lithium vanadium phosphate (FeLi3V(PO4)3) 204653-31-6, Lithium titanium vanadium phosphate (Li3TiV(PO4)3) 204653-32-7, Aluminum lithium vanadium phosphate (AlLi3V(PO4)3) 204653-33-8, Chromium lithium potassium phosphate (CrLi3K(PO4)3) 204653-34-9, Lithium molybdenum potassium phosphate (Li3MoK(PO4)3)
(electrode material for secondary lithium-ion **battery**)

=> d his l58-

(FILE 'HCA' ENTERED AT 21:15:24 ON 29 OCT 2002)

FILE 'REGISTRY' ENTERED AT 21:28:14 ON 29 OCT 2002

FILE 'HCA' ENTERED AT 21:28:27 ON 29 OCT 2002
L58 156 S L3/P
L59 13 S L52 AND (L14 OR L15 OR L16 OR L17 OR 52/SC,SX OR 72/SC,
L60 0 S L59 NOT (L54 OR L55 OR L56 OR L57)